

LIFE SCIENCES CONTRIBUTIONS
ROYAL ONTARIO MUSEUM
NUMBER 110

JUDITH L. EGER

Systematics of the
Genus *Eumops*
(Chiroptera: Molossidae)

Publication date: 13 June 1977

ISBN 0-88854-196-1

ISSN 0384-8159

Suggested citation: Life Sci. Contr., R. Ont. Mus.

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PRICE: \$3.50

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100 Queen's Park, Toronto, Canada

PRINTED AND BOUND IN CANADA AT THE UNIVERSITY OF TORONTO PRESS

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Systematics of the Genus *Eumops* (Chiroptera: Molossidae)

Abstract

Bats of the genus *Eumops* range from the southern United States to central Argentina. In this study, 11 operational taxonomic units (OTUs) were designated within the genus; *Eumops auripendulus*, *E. bonariensis*, *E. dabbenei*, *E. glaucinus glaucinus*, *E. g. floridanus*, *E. hansae*, *E. maurus*, *E. perotis perotis*, *E. p. californicus*, *E. trumbulli*, and *E. underwoodi*.

A systematic examination of the genus based on morphometric characters included analyses of sexual dimorphism, relationships among all OTUs, and geographic variation. Males were larger than females in seven taxa examined for sexual dimorphism.

Phenetic relationships among OTUs were assessed using cluster analysis and principal component analysis. These numerical taxonomic techniques established nine species within the genus: *Eumops auripendulus*, *E. bonariensis*, *E. dabbenei*, *E. glaucinus*, *E. hansae*, *E. maurus*, *E. perotis*, *E. trumbulli*, and *E. underwoodi*.

Geographic variation was studied in *Eumops auripendulus* and *E. g. glaucinus*, using discriminant functions analysis and in addition using Sum of Squares Simultaneous Testing Procedure analysis in *E. glaucinus*. These analyses indicate that *E. auripendulus* and *E. glaucinus* have each differentiated into two subspecies.

Introduction

Bats of the genus *Eumops*, widely distributed in the Americas and most abundant in the Neotropical region, occur from southern areas of California, Arizona, Texas, and Florida, throughout Mexico and Central America, and south to central Argentina. Populations of *Eumops* are also found in Cuba and Jamaica in the Greater Antilles and in Trinidad. Although widely distributed geographically, these bats are not numerous in collections.

The altitudinal and ecological distributions of *Eumops* are also great, as species occur at elevations ranging from sea level to 3,000 m, in tropical rain forest, deciduous forest, savanna, and montane environments. *Eumops* roosts in rocks, cliffs, attics of buildings, and hollow trees (Walker, 1968), but little is known of its natural history other than Barbour and Davis's (1969) review of *Eumops perotis californicus*. All species are considered to be insectivorous, but only *E. perotis californicus* is known to eat insects (Ross, 1961; Easterla and Whitaker, 1972).

Eumops, in common with other genera of the family Molossidae, has a tail

that extends beyond the posterior margin of the uroptagium, hence the common name "free-tail bats". Features diagnostic of the genus include large, rounded pinnae that arise from a single point or are joined medially on the forehead. Smooth upper lips distinguish *Eumops* from the genus *Tadarida*. The antitragus is well developed, and the tragus is either small and pointed or broad and square. All species possess a gular gland that is well developed in males but rudimentary in females. Species vary in size from *E. bonariensis*, with a minimum forearm length of 37 mm, to *E. perotis*, with a maximum forearm length of 83 mm. The shape of the skull is cylindrical; basisphenoid pits are well developed. The upper incisors are slender, with a curved shaft. The palate is slightly arched, as compared with the domed palate of species of the genus *Promops*. The length of the third commissure of the third upper molar has been used as a taxonomic character to group species of the family. African bats of the genus *Tadarida*, for example, were divided into subgenera partially on the length of the third commissure (Hayman and Hill, 1971). Species of *Eumops* may be divided into four groups according to the degree of development of the third commissure: 1) lacking, 2) rudimentary, 3) one-fourth to one-half the length of the second commissure, and 4) same length as the second commissure.

The dental formula for the genus is: $\frac{1}{2}, \frac{1}{1}, \frac{1 \text{ or } 2}{2}, \frac{3}{3}$

Miller (1906) established the genus *Eumops* and included 10 species of molossids that had previously been placed in the genera *Molossus* and *Promops*. Sanborn (1932) reviewed the taxonomy of *Eumops* and reduced the number of species to six: *E. abrasus*, *E. bonariensis*, *E. glaucinus*, *E. hansae*, *E. maurus*, and *E. perotis*. Since 1932 other species have been described: *E. underwoodi* (Goodwin, 1940), *E. sonoriensis* (Benson, 1947), *E. amazonicus* (Handley, 1955), and *E. geijskesi* (Husson, 1962).

I initiated this study to examine variation within the genus and to clarify the phenetic relationships in this group of molossids. I placed particular emphasis on providing a phenetic classification based on similarity in size and shape among taxa assessed over numerous characters. Such an approach has not been carried out for *Eumops* heretofore. A prime objective was to compare results of numerical with those of traditional taxonomy. Numerical taxonomic methods have been used in other studies of bat systematics, exemplary studies being those of Baker *et al.* (1972a), Findley (1972), and Smith (1972).

In addition to a numerical taxonomic study of the genus, this study included a review of geographic variation within *E. auripendulus* and *E. glaucinus*. Finally, results of these studies were incorporated in a critical review and revision of the genus *Eumops*.

Materials and Methods

Specimens studied were either prepared study skins and skulls or preserved in alcohol (some with skulls removed). Specimens examined are in the collections of the following institutions: American Museum of Natural History (AMNH); The Academy of Natural Sciences, Philadelphia (ANSP); Bell Museum of Natural History, University of Minnesota, Minneapolis (MMNH); British Museum (Natural History) (BMNH); Carnegie Museum (CM); Dallas Museum of Natural History (DMNH); Field Museum of Natural History (FMNH); Institute of Jamaica (IJ); Institut Royal des Sciences Naturelles de Belgique (IRSNB); The Museum of Natural History, University of Kansas (KU); Los Angeles County Museum (LACM); Louisiana State University Museum of Zoology, Baton Rouge (LSU); Museum of Comparative Zoology, Harvard University (MCZ); Museo de Historia Natural Uniandes, Universidad de los Andes, Bogotá (MHNU); Muséum National d'Histoire Naturelle, Paris and Brunoy (MNHN); Museum of Southwestern Biology, University of New Mexico, Albuquerque (MSB); Museum of Vertebrate Zoology, University of California, Berkeley (MVZ); Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); Royal Ontario Museum (ROM); Texas Cooperative Wildlife Research Collection, Texas A&M University (TCWC); The Museum, Texas Tech University, Lubbock (TTU); Universidade de São Paulo (USP); University of Arizona Department of Biological Sciences (UA); University of Illinois Museum of Natural History (UI); University of Miami Department of Zoology (UM); University of Michigan Museum of Zoology (UMMZ); Universidad Nacional Autónoma de México (UNAM); National Museum Natural History (USNM); Universidad de Valle, Cali (UCV); Yale Peabody Museum (YPM).

Thirty-two morphological characters were measured as follows:

External

1. Forearm length (FOAR), distance from the wrist to the elbow, including the skin.
2. Third digit metacarpal length (3DME), distance from the wrist, including the skin, to the metacarpal-phalangeal joint.
3. First phalanx length (1PHL), distance from the metacarpal-phalangeal joint to the distal end of the first phalanx of the third digit.
4. Second phalanx length (2PHL), distance from the proximal to the distal end of the second phalanx of the third digit.
5. Fourth digit metacarpal length (4DME).
6. First phalanx length (1PHL), of the fourth digit.
7. Second phalanx length (2PHL), of the fourth digit.
8. Fifth digit metacarpal length (5DME).
9. First phalanx length (1PHL), of the fifth digit.
10. Second phalanx length (2PHL), of the fifth digit.
11. Tail vertebrae (TVER), length of tail vertebrae.
12. Ear length (EARS), distance from the base of the notch to the uppermost margin of the pinna.
13. Tibia length (TIBI), distance from the tibia-femur joint to the tibia-tarsal joint.

Mandible

14. Condylolincisive length (CIMA), distance from the condyles to the anterior face of the incisors.
15. Greatest length (GRLG), distance from one condyle to the anterior face of the incisors.
16. Mandibular toothrow length (C-M₃), distance from the canine to the third molar.
17. Canine width (C₁-C₁), width across the canines, including cingula.

Skull

18. Septum width between basisphenoid pits (WBSP), minimum distance across the septum.
19. Basisphenoid pit length (LBSP), distance from the anterior to posterior edge of the basisphenoid pit.
20. Skull length (TOLG), distance from the lambdoid crest to the anterior face of the incisors.
21. Condylolincisive length (CBLG), distance from the occipital condyles to the anterior face of the incisors.
22. Palatal length (PALA), distance from the anterior face of the incisors to the posterior margin of the palate lateral to the posteromedial projection.
23. Zygomatic width (ZYGO), distance between the zygomatic arches measured on the squamosal bones.
24. Mastoid width (MAST), greatest width at the mastoid processes.
25. Lachrymal width (LACH), distance across the lachrymal processes.
26. Interorbital width (IOWI), distance between the orbits measured below the lachrymal processes.
27. Braincase height (HBCA), distance from the ventral border of the foramen magnum to the parietal, excluding the saggital crest.
28. Width across the third molars (M³-M³), distance across the crowns of the third molars.
29. Maxillary toothrow (C-M³), distance from the anterior face of the canine to the posterior edge of the third molar.
30. Canine width (C¹-C¹), width across the canines including cingula.
31. Postorbital constriction (POCO), minimum interorbital distance measured across the frontals.
32. Braincase breadth (BBC2), maximum width measured dorsal to the auditory bullae with the blades of the callipers resting on the zygoma.

Six other characters were measured, as follows:

33. Total length (TOLG), distance from the tip of the nose to the tip of the tail.
34. Hindfoot (HDFT), distance from the heel to the tips of the claws.
35. Tragus length (TRAG), measured from the base to the tip.
36. Height of lower canine (HTLC), measured buccally from the base of the cingulum to the crown.
37. Height of the upper canine (HTUC), measured buccally from the base of the cingulum to the crown.
38. Braincase width (BBC1), anterior width of the braincase measured where the zygoma anastomose with the parietals.

These six characters were not available for approximately 25 per cent of the specimens and therefore were not used in all multivariate analyses, which generally require complete data matrices.

Measurements were taken with dial calipers to the nearest 0.1 mm for wing bones, the nearest mm for body measurements, and the nearest 0.05 mm for cranial measurements. The length of the tibia, often difficult to measure, was verified by radiographs where possible. Descriptions of pelage colour follow those given by Ridgway (1912).

Mensural data were supplemented by additional information (reproductive condition, age, weight, locality, elevation, and habitat) from specimens or labels. If the specimen was a prepared skin and skull, external measurements were recorded if given; if the specimen was preserved in alcohol, body measurements were taken. Only data from adult specimens were used in statistical analysis. Adults were considered to be individuals with complete fusion of epiphyses of metacarpals and phalanges and with complete fusion of the sphenoid bones in the skull.

Bats of the genus *Eumops* are currently divided into 16 discrete taxa with subspecies as the basic units. But to study interspecific variation, subspecies of a species were grouped where distributions of subspecies are continuous, e.g., *E. bonariensis*. Where subspecies are geographically isolated, e.g., *E. glaucinus glaucinus* and *E. g. floridanus*, or when the status of a taxon is in question, e.g., *E. trumbulli*, subspecies were used as OTUs (Operational Taxonomic Units; Sneath and Sokal, 1973). Table 1 lists the 11 OTUs studied and gives the geographic distribution of each. For *E. g. floridanus* only males were available and for *E. dabbenei* only females were available.

Grouping Procedures for Analysis of Geographic Variation

Sufficiently large samples were available only for *E. auripendulus* and *E. glaucinus* to allow examination of geographic variation. Where possible, bats from distinct localities were used as the basic unit, but as some samples were small, several contiguous localities were grouped to yield larger samples after considering likely geographic or ecological barriers that might limit dispersal (see Tables 4–6). Geographic distributions of these two taxa are illustrated in Fig. 15 and 21.

Statistical Methods

The following analyses were made on the IBM/370 computer at the University of Toronto Computer Centre. Sample sizes of males and females of seven taxa were sufficiently large to test for sexual dimorphism: *Eumops a. auripendulus*, *E. bonariensis beckeri*, *E. g. glaucinus*, *E. p. perotis*, *E. p. californicus*, *E. trumbulli*, and *E. underwoodi sonoriensis*.

Differences in character variability between sexes were tested for significance within OTUs by the *F*-test of variance ratios (Sokal and Rohlf, 1969). Differences in character means between males and females were examined using Student's *t*-test (Sokal and Rohlf, 1969); the formula for equal or unequal sample variances was used according to results of the *F*-test of the variance ratio. Phenetic relationships among OTUs were assessed using two types of

Table 1. Sample details for OTUs of *Eumops* used in this study

OTU	Distribution and Number
1. <i>E. auripendulus</i> (EAUR) n = 307; 85 ♂♂, 222 ♀♀	Argentina (6), Brazil (79), Belize (1), Colombia (33), Costa Rica (62), Ecuador (4), El Salvador (1), French Guiana (3), Guatemala (1), Guyana (30), Honduras (10), Jamaica (1), Nicaragua (1), Panama (28), Peru (17), Surinam (12), Trinidad (1), Venezuela (17)
2. <i>E. bonariensis</i> (EBON) n = 157; 64 ♂♂, 93 ♀♀	Argentina (14), Bolivia (38), Brazil (7), Colombia (11), Guyana (5), Honduras (1), Mexico (6), Panama (5), Paraguay (58), Peru (1), Venezuela (2)
3. <i>E. dabbeni</i> (EDAB) n = 3 ♀♀	Argentina (1), Colombia (1), Venezuela (1)
4. <i>E. g. glaucinus</i> (EGGL) n = 246; 86 ♂♂, 160 ♀♀	Bolivia (2), Brazil (11), Colombia (32), Costa Rica (24), Cuba (33), Ecuador (2), Guyana (16), Honduras (6), Jamaica (9), Mexico (33), Nicaragua (1), Panama (2), Paraguay (3), Peru (14), Venezuela (58)
5. <i>E. glaucinus floridanus</i> (EGFL) n = 21 ♂♂	Florida (21)
6. <i>E. hansae</i> (EHAN) n = 8; 3 ♂♂, 5 ♀♀	Brazil (2), Costa Rica (1), Guyana (3), Panama (1), Venezuela (1)
7. <i>E. maurus</i> (EMAU) n = 3; 1 ♂, 2 ♀♀	Guyana (1), Surinam (2)
8. <i>E. p. perotis</i> (EPPE) n = 60; 22 ♂♂, 38 ♀♀	Argentina (29), Brazil (29), Venezuela (2)
9. <i>E. perotis californicus</i> (EPCA) n = 157; 46 ♂♂, 111 ♀♀	Mexico (9), United States (148)
10. <i>E. trumbulli</i> (ETRU) n = 55; 23 ♂♂, 32 ♀♀	Brazil (16), Colombia (22), Guyana (6), Peru (6), Surinam (1), Venezuela (4)
11. <i>E. underwoodi</i> (EUND) n = 72; 28 ♂♂, 44 ♀♀	Belize (3), Honduras (4), Mexico (51), United States (14)

multivariate techniques: an R-mode analysis of correlations among characters and a Q-mode analysis of correlations or distances between pairs of OTUs.

R-MODE ANALYSIS

Principal components can be extracted from a matrix of correlations among characters and can be presented as three-dimensional models of OTUs (Sneath and Sokal, 1973). In this study the components represent a set of new orthogonal axes in 32-dimensional character space. The first principal component

explains maximum character variance; the second is orthogonal (uncorrelated) to the first and is placed so that it explains a maximum of the remaining character variance; and the third is orthogonal to the first and second. The resulting 3-D model usually represents relationships among OTUs accurately although there may be some distortion of distances among similar OTUs. To detect possible distortion, a shortest minimally connected network (Rohlf, 1970) can be computed from the original distance matrix and superimposed on the 3-D model. Two principal component analyses were performed, one using standardized data and the other using data divided by forearm length (before standardization) to reduce the overall effect of size (see Robins and Schnell, 1971).

Q-MODE ANALYSIS

Average taxonomic distance coefficients and correlation coefficients were calculated for all pairs of OTUs using standardized data (mean of zero and a standard deviation of one). Average linkage cluster analysis (unweighted pair-group method, UPGMA, Sneath and Sokal, 1973) was performed on the distance and correlation matrices, and results were summarized in phenograms. The UPGMA method was used because it produces the highest correlation between a phenogram and its similarity matrix (cophenetic correlation, see Sneath and Sokal, 1973). For some analyses, all measurements were divided (before standardization) by forearm length to reduce the effect of size on the resultant clustering. Cophenetic correlation coefficients were calculated for each phenogram.

As the first principal component is often a general size factor, I also tried to reduce the effect of size in forming clusters by removing the first principal component from a matrix of distances between OTUs (see Robins and Schnell, 1971). The coefficient of correlation of cophenetic values (Crovello, 1969) was calculated to compare phenograms resulting from different methods of analysis. The above procedures were carried out by programmes in NT-SYS written by F. J. Rohlf and associates at Stoney Brook, S.U.N.Y.

INTRASPECIFIC VARIATION

Intraspecific variation was assessed in female *E. auripendulus*. Total length, tail vertebrae, and tragus were not included in the multivariate analysis. The approach was to consider all characters simultaneously to test for difference among locality samples by multivariate analysis of variance (Wilks' likelihood ratio method), and to assess the relative positions of localities in multi-dimensional character space by generalized discriminant functions analysis (Cooley and Lohnes, 1971; Seal, 1966). Ninety-five per cent confidence circles for the centroids were constructed (Seal, 1966) to indicate the degree of overlap among samples. Discriminant functions analysis requires complete data matrices, and values of missing characters were estimated by linear regression. The character that had the highest correlation (based on the pooled sample) with the missing measurement was used in a linear regression equation to provide the best least-squares estimate of the missing value.

Intraspecific variation in female *E. glaucinus* was examined by discriminant functions analysis and in males by multiple comparison tests, Gabriel's (1964)

Sum of Squares Simultaneous Test Procedure (SS-STP). Application of SS-STP to geographic variation was discussed by Gabriel and Sokal (1969). I followed Power (1970) and arranged means in decreasing order of magnitude rather than considering only those samples from contiguous localities. For each locality the mean, standard error, standard deviation, coefficient of variation, and range were calculated for all 38 characters. (These statistics are on file, Department of Mammalogy, ROM.)

The above multivariate procedures were carried out using programmes on file in the Department of Mammalogy, ROM: Missing data estimator (MDE), and Discriminant functions analysis (Canan).

Results

Sexual Dimorphism

Of the 16 taxa studied, sample sizes of males and females of *E. a. auripendulus*, *E. bonariensis beckeri*, *E. g. glaucinus*, *E. perotis californicus*, *E. p. perotis*, *E. trumbulli*, and *E. underwoodi sonoriensis* were sufficiently large to test sexual dimorphism. These seven taxa exhibited statistically significant dimorphism, with *E. bonariensis beckeri* being the least dimorphic (26 per cent of characters) and *E. p. perotis* the most dimorphic (68 per cent of characters). Length of mandible and skull were consistently dimorphic in all seven OTUs. Dimorphism in external body measurements was generally absent. Among cranial characters, basisphenoid pits, breadth of skull, and postorbital constriction show little dimorphism. For dimorphic characters males were consistently larger than females, and in the ensuing sections males and females were therefore treated separately.

Principal Component Analysis

Principal components I and II account for 89.12 and 5.86 per cent of total character variation for males and 90.64 and 5.63 per cent for females. Hence, with 95 per cent of the total variance explained, a reduction of character space to two dimensions should not distort distances between OTUs (Fig. 1 and 2). Principal component I is generally a size factor with high loadings on all characters except length of basisphenoid pit and width of septum (Table 2) and separates the small, medium, and large OTUs. The basisphenoid pit characters have high loadings on the second component and separate *E. bonariensis* from *E. maurus* and *E. p. perotis*, *E. trumbulli*, and *E. p. californicus* from *E. underwoodi*. Figures 3 and 4 illustrate results of principal component analysis (PCA) on characters divided by forearm length. The first three principal components explain 57.93, 16.44, and 10.14 per cent of the variance (males) and 45.40, 24.15, and 11.67 per cent (females). In both males and females, principal component I separates *E. hansae* and *E. maurus* from the remaining OTUs and is a contrast between skull and wing measurements (see Table 3). Principal component II has high loadings for ear length and separates *E. perotis* and *E. trumbulli* from the other taxa. Characters contributing to the high loadings on component III are not consistent in males and females. In males there are high

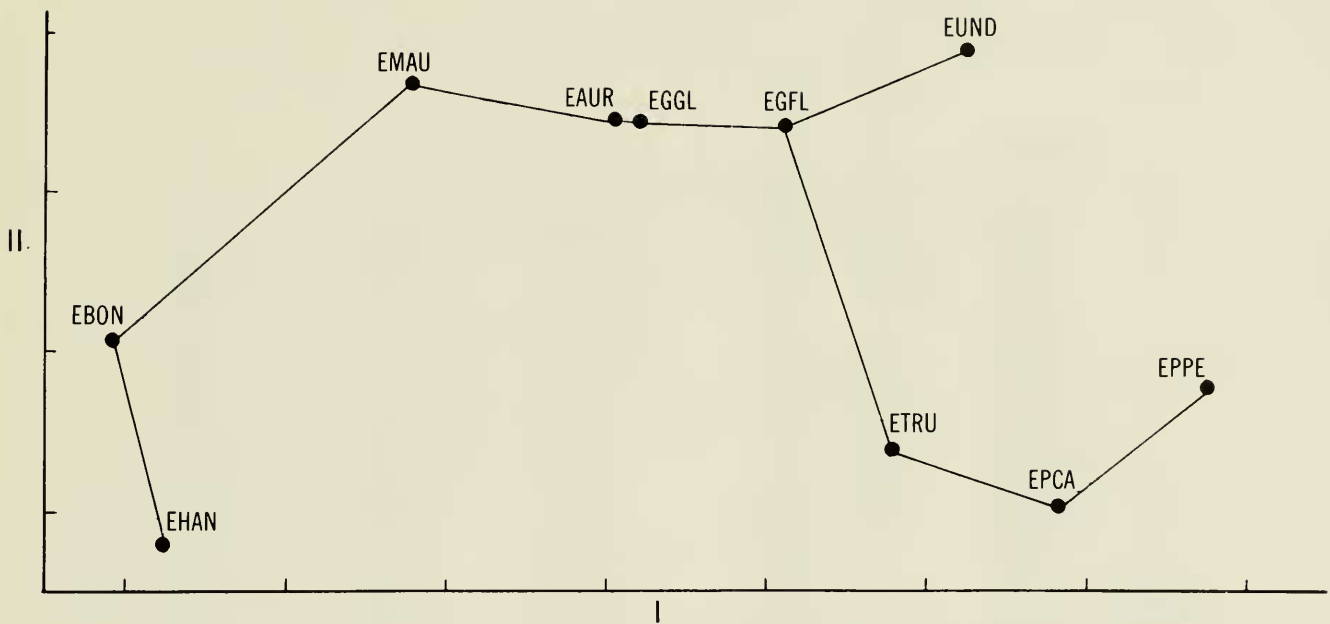


Fig. 1. OTUs of male *Eumops* projected onto the first two principal components of a matrix of correlations among characters with a minimum spanning tree superimposed upon the OTUs. See Table 1 for explanation of abbreviations.

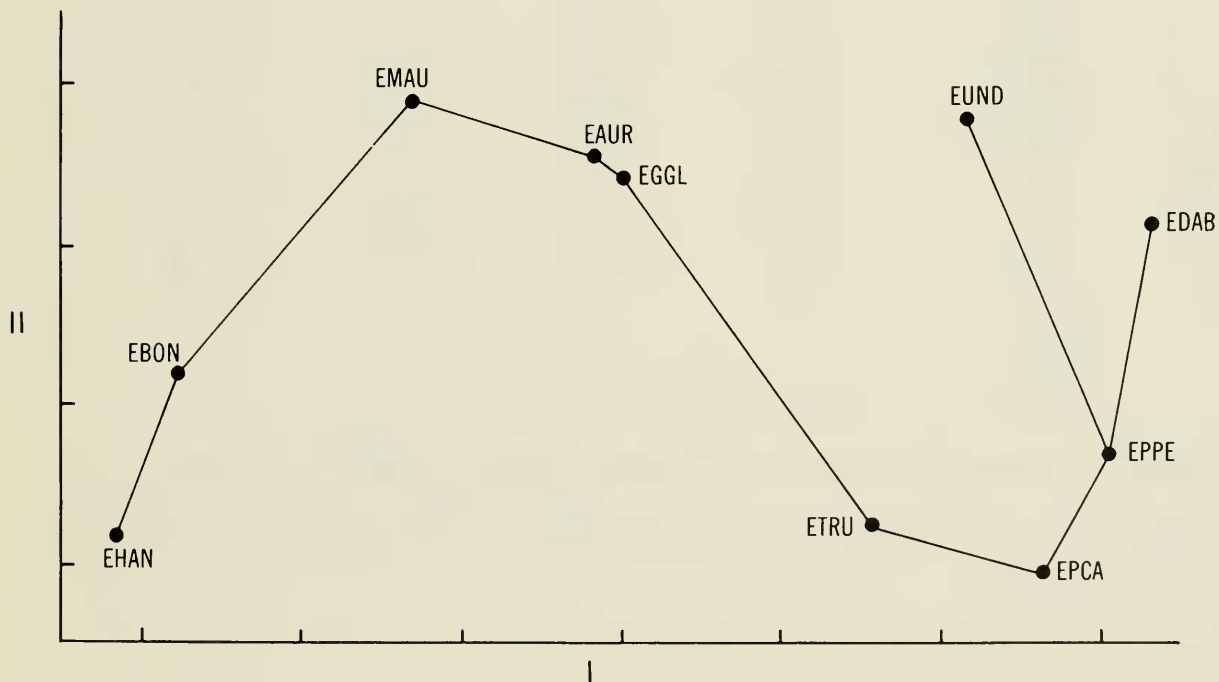


Fig. 2. OTUs of female *Eumops* projected onto the first two principal components of a matrix of correlations among characters with a minimum spanning tree superimposed upon the OTUs. See Table 1 for explanation of abbreviations.

Table 2. Loadings of characters for the first two principal components based on matrices of correlations among characters of male and female *Eumops*

Character	♂♂		♀♀	
	I	II	I	II
FOAR	0.992	-0.020	0.991	-0.041
3DME	0.991	-0.008	0.992	-0.015
1PHL	0.984	0.107	0.984	0.111
2PHL	0.971	0.178	0.992	0.074
4DME	0.988	0.005	0.992	-0.018
1PHL	0.973	0.152	0.979	0.103
2PHL	0.768	0.375	0.812	0.461
5DME	0.978	0.028	0.984	0.002
1PHL	0.972	0.140	0.980	0.004
2PHL	0.920	0.157	0.979	-0.007
TVER	0.944	0.159	0.975	0.085
EARS	0.857	-0.462	0.826	-0.478
TIBI	0.942	0.103	0.969	0.031
W BSP	0.379	0.872	0.260	0.883
L BSP	0.717	-0.673	0.720	-0.666
CIMA	0.989	-0.128	0.994	-0.084
GRLG	0.991	-0.119	0.992	-0.093
C-M ₃	0.999	-0.029	0.999	-0.003
C ₁ -C ₁	0.965	-0.083	0.957	0.112
TOLG	0.988	-0.131	0.992	-0.085
CBLG	0.984	-0.160	0.987	-0.137
PALA	0.989	-0.099	0.993	-0.057
ZYGO	0.990	-0.042	0.996	-0.008
MAST	0.975	-0.032	0.989	0.006
LACH	0.953	-0.010	0.962	0.030
IOWI	0.962	-0.023	0.964	0.059
HBCA	0.950	0.207	0.966	0.200
M ³ -M ³	0.995	-0.032	0.998	0.002
C-M ³	0.996	-0.074	0.998	-0.057
C ¹ -C ¹	0.988	-0.056	0.991	-0.045
POCO	0.897	0.126	0.941	0.149
BBC2	0.986	-0.004	0.997	-0.021
Percent Variance Explained	89.12	5.86	90.64	5.73

positive loadings of metacarpals and low positive values for width of skull characters. Females show this same contrast between length and width of skull, but only the metacarpal and second phalanx of the fifth digit have high positive loadings.

Cluster Analysis

The distance phenogram for males (Fig. 5) divides the OTUs into three main groups: *E. auripendulus*, *E. g. glaucinus*, *E. g. floridanus*, and *E. maurus*; *E. p. perotis*, *E. p. californicus*, and *E. trumbulli*; *E. bonariensis* and *E. hansae*. Similarly, clusters in the phenogram for females (Fig. 5) consist of *E. auripendulus*, *E. glaucinus*, and *E. maurus*; *E. bonariensis* and *E. hansae*; and *E. p.*

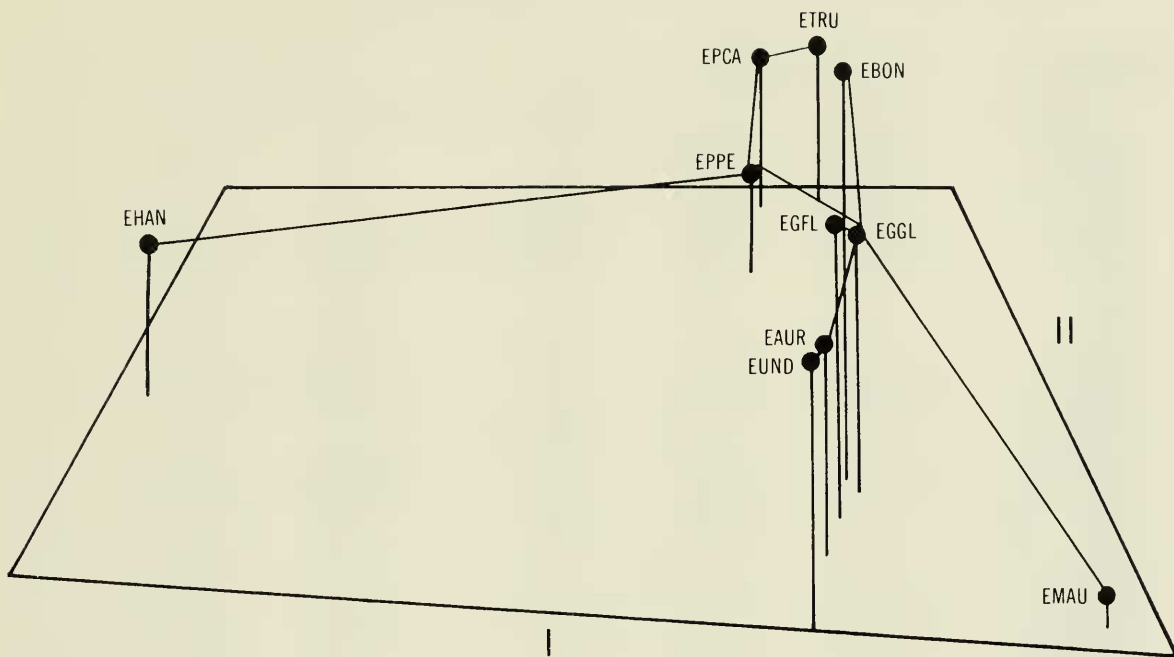


Fig. 3. OTUs of male *Eumops* projected onto the first three principal components of a matrix of correlations among characters divided by forearm length with a minimum spanning tree superimposed upon the OTUs. See Table 1 for explanation of abbreviations.

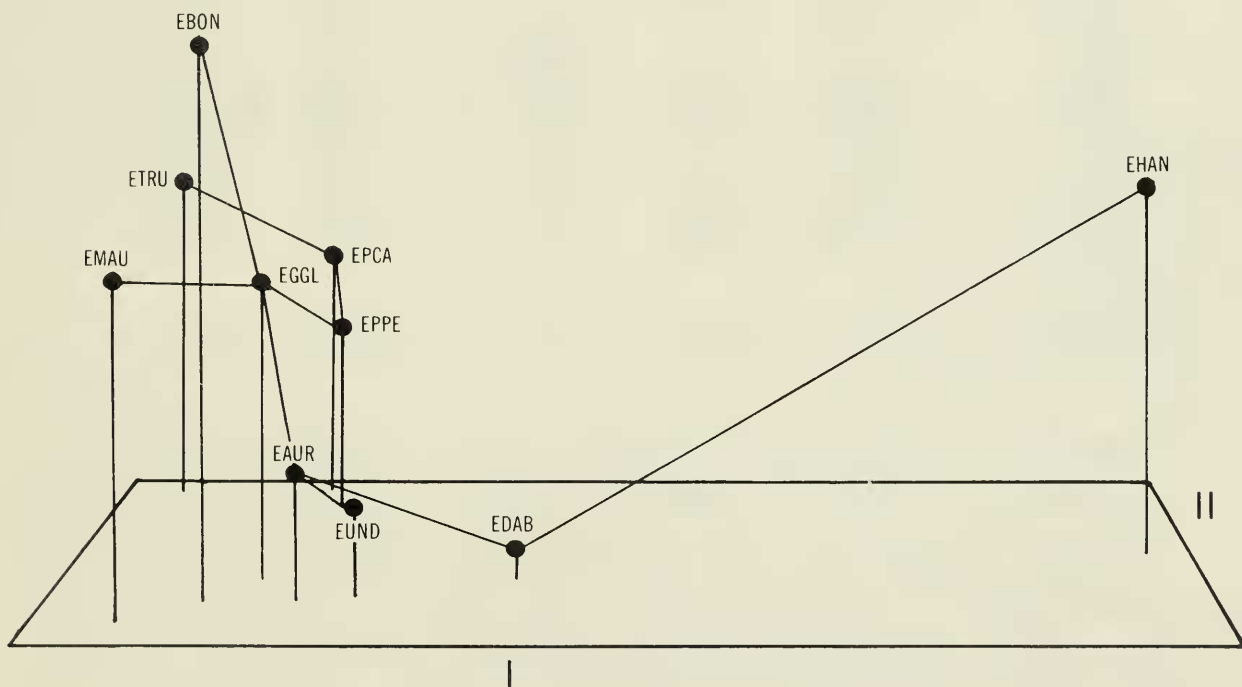


Fig. 4. OTUs of female *Eumops* projected onto the first three principal components of a matrix of correlations among characters divided by forearm length with a minimum spanning tree superimposed upon the OTUs. See Table 1 for explanation of abbreviations.

Table 3. Loadings of characters/forearm for the first three principal components based on matrices of correlations among characters of male and female *Eumops*

Character	♂♂			♀♀		
	I	II	III	I	II	III
3DME	0.423	-0.062	0.745	0.155	-0.928	0.221
1PHL	0.608	-0.547	-0.267	-0.326	-0.715	-0.360
2PHL	0.838	-0.366	-0.070	-0.101	-0.535	-0.653
4DME	0.734	0.051	0.620	-0.285	-0.630	0.019
1PHL	0.698	-0.504	-0.186	-0.558	-0.650	-0.316
2PHL	-0.094	-0.731	-0.241	-0.224	-0.727	-0.428
5DME	0.601	-0.236	0.585	-0.295	-0.605	0.543
1PHL	0.689	-0.476	0.293	-0.299	-0.255	0.082
2PHL	0.892	-0.215	-0.198	-0.009	-0.503	0.464
TVER	0.016	-0.684	-0.584	-0.051	-0.693	0.120
EARS	-0.453	0.828	0.016	0.152	0.925	0.234
TIBI	0.477	-0.282	-0.626	0.004	-0.350	0.230
WBSP	0.398	-0.702	-0.024	-0.321	-0.714	-0.219
LBSP	-0.850	0.386	-0.005	0.756	0.450	0.459
CIMA	-0.905	0.187	-0.194	0.882	0.249	-0.350
GRLG	-0.921	0.144	-0.173	0.948	0.193	-0.199
C-M ₃	-0.813	-0.079	-0.160	0.791	-0.025	-0.563
C ₁ -C ₁	-0.884	-0.172	-0.210	0.709	-0.348	-0.528
TOLG	-0.979	-0.097	-0.095	0.991	0.031	-0.017
CBLG	-0.986	0.052	-0.063	0.963	0.206	0.052
PALA	-0.923	0.016	-0.221	0.935	0.090	-0.258
ZYGO	-0.923	-0.316	0.142	0.957	-0.243	0.067
MAST	-0.803	-0.368	0.410	0.827	-0.351	0.367
LACH	-0.846	-0.351	0.310	0.904	-0.310	0.043
IOWI	-0.890	-0.359	0.164	0.907	-0.347	-0.060
HBCA	-0.622	-0.691	0.003	0.666	-0.688	0.160
M ³ -M ³	-0.888	-0.412	0.080	0.895	-0.353	0.250
C-M ³	-0.960	-0.051	-0.064	0.953	0.099	-0.211
C ¹ -C ¹	-0.821	-0.073	0.026	0.665	0.150	-0.576
POCO	-0.695	-0.532	0.355	0.723	-0.476	0.469
BBC 2	-0.756	-0.369	0.475	0.819	-0.315	0.421
Percent Variance Explained	57.93	16.44	10.14	45.40	24.15	11.67

perotis, *E. p. californicus*, *E. trumbulli*, and *E. dabbenei*. The cophenetic correlations (0.74 and 0.75, respectively) indicate a poor fit of the phenograms to the similarity matrices. The clusters formed in the distance/forearm phenograms (Fig. 6) differ from the previous phenograms. OTUs *E. glaucinus* and *E. g. floridanus*; *E. auripendulus* and *E. underwoodi*; *E. p. perotis*, *E. p. californicus*, and *E. trumbulli* form three main clusters. The cophenetic correlations are 0.98 for males and 0.94 for females and represent a very good fit of the phenograms to the matrices. The coefficient of correlation of cophenetic values for the distance phenograms is 0.47 for males and 0.19 for females, indicating little similarity between the two methods.

Results of cluster analysis of correlation coefficients (Fig. 7) are similar to those produced by distance/forearm, but the cophenetic correlations are lower

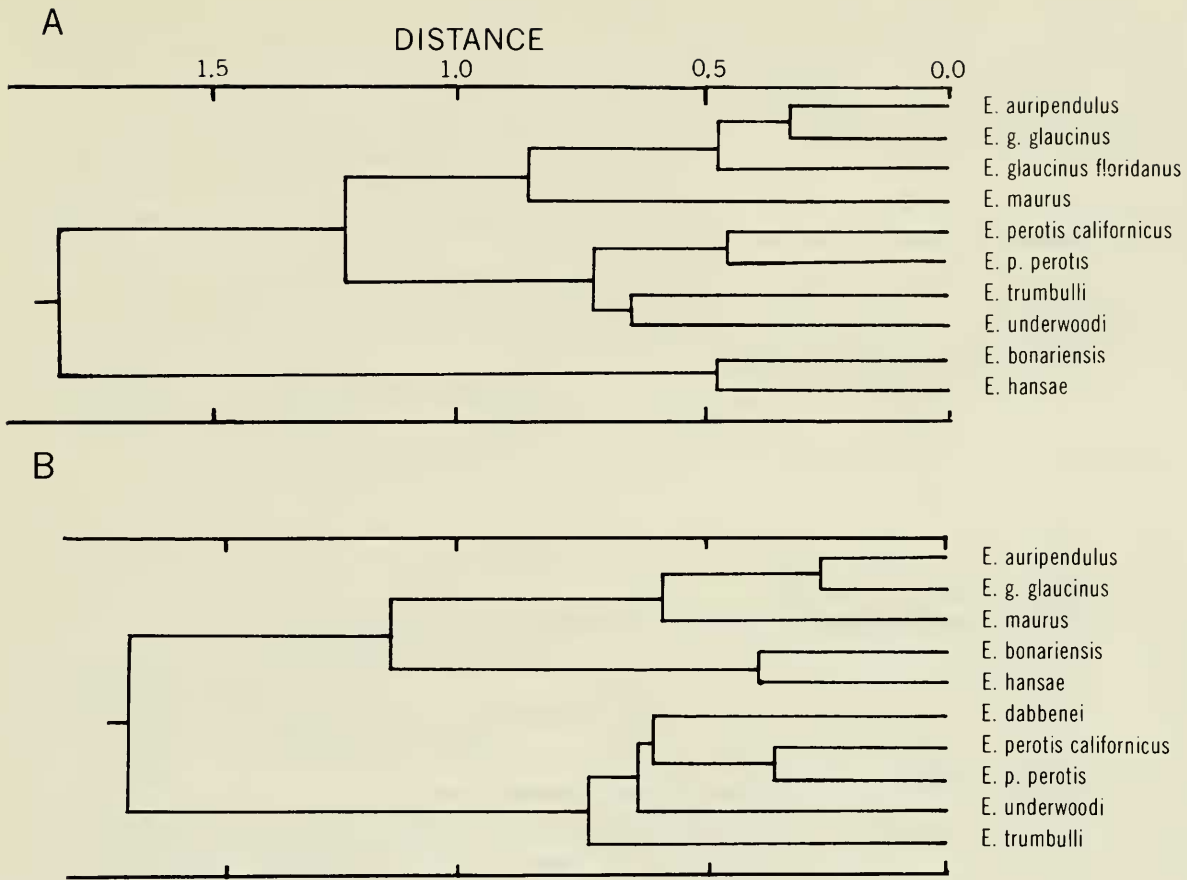


Fig. 5. Phenograms of average taxonomic distance.
 A. Male *Eumops*; cophenetic correlation is 0.74
 B. Female *Eumops*; cophenetic correlation is 0.75

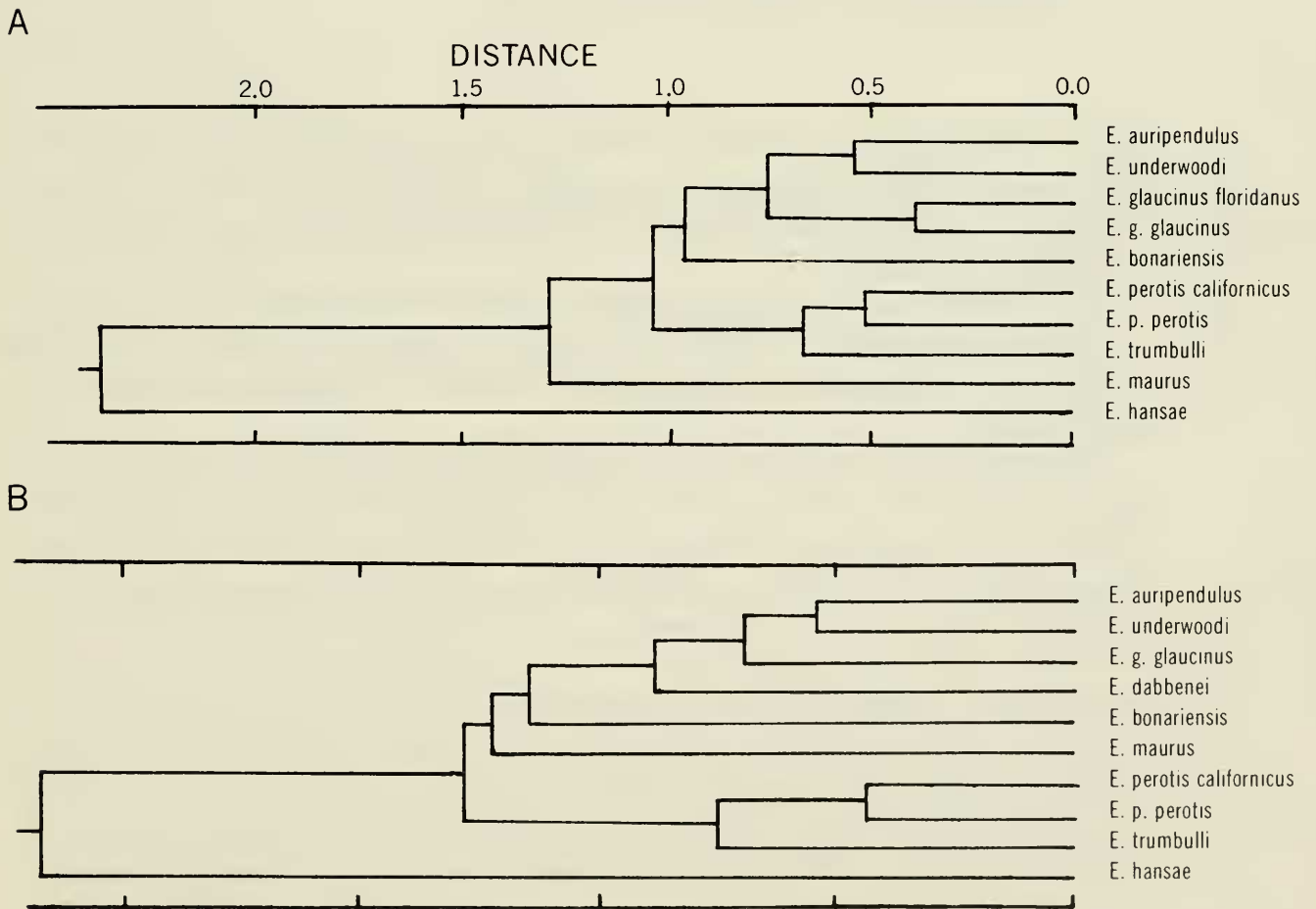


Fig. 6. Phenograms of average taxonomic distance based on characters divided by forearm length.
 A. Male *Eumops*; cophenetic correlation is 0.98
 B. Female *Eumops*; cophenetic correlation is 0.94

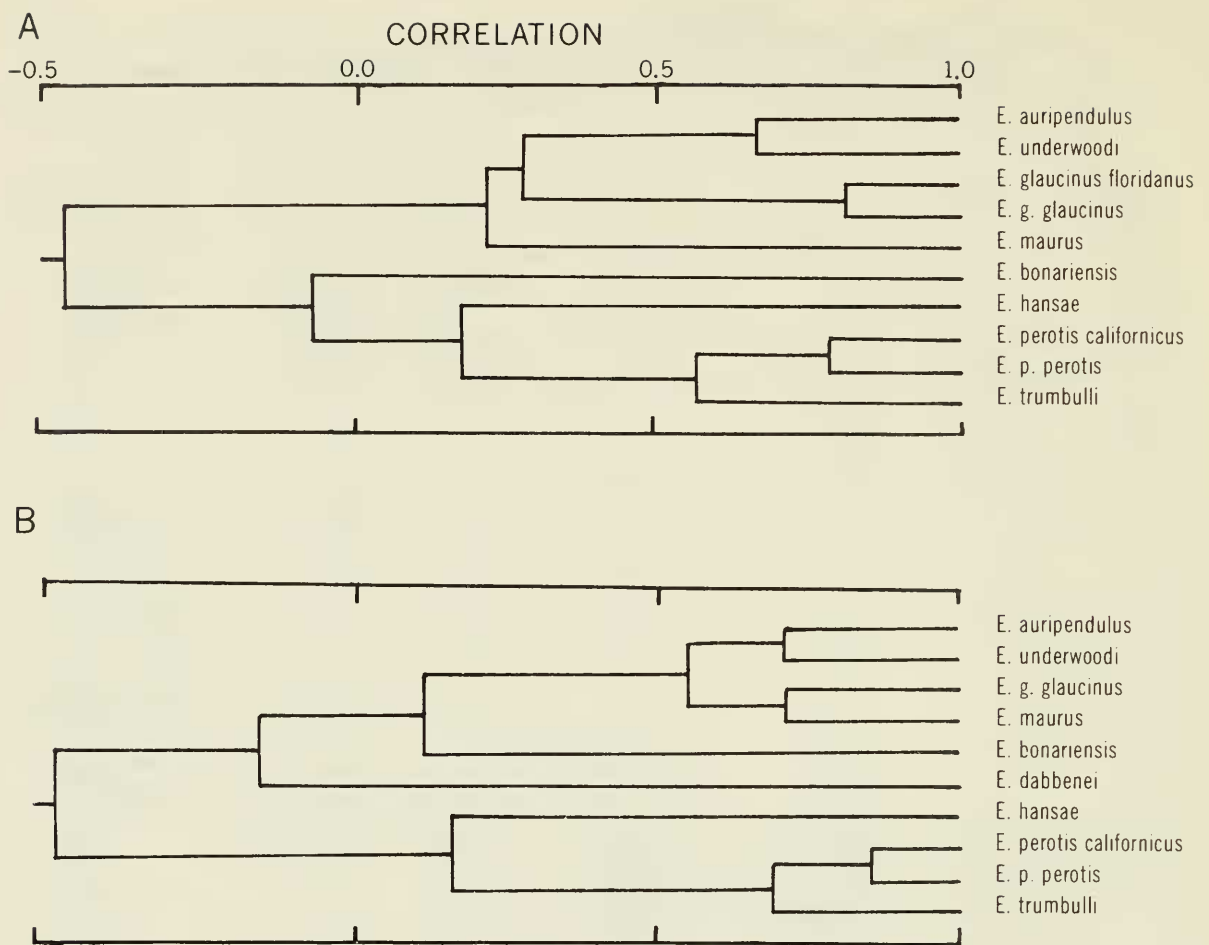


Fig. 7. Phenograms of correlation coefficients.

A. Male *Eumops*; cophenetic correlation is 0.89

B. Female *Eumops*; cophenetic correlation is 0.89

(males, 0.89; females, 0.89), indicating more distortion in the correlation phenograms. The coefficients of correlation of cophenetic values comparing these two correlation methods are 0.79 (males) and 0.81 (females), indicating a reasonable similarity.

The correlation/forearm phenograms (Fig. 8) are similar to the original correlation phenograms. The cophenetic correlation for males indicates the same fit of phenogram to similarity matrix (0.89) but for females the fit is not as good (0.81).

The effect of removing principal component I (presumably a size factor) from the distance matrix is illustrated in Fig. 9. The two main clusters formed differ considerably from those produced in the other analyses. The cophenetic correlations (male, 0.81; female, 0.83) indicate that the phenograms represent the similarity matrices reasonably well.

Geographic Variation in *Eumops auripendulus*

I divided specimens of female *Eumops auripendulus* into 10 locality samples (Table 4). Multivariate analysis of variance indicated that significant differences exist among localities (F transformation of Wilks' lambda = 2.86, d.f. = 315 and 1271, $P < 0.001$). In the generalized discriminant functions analysis,

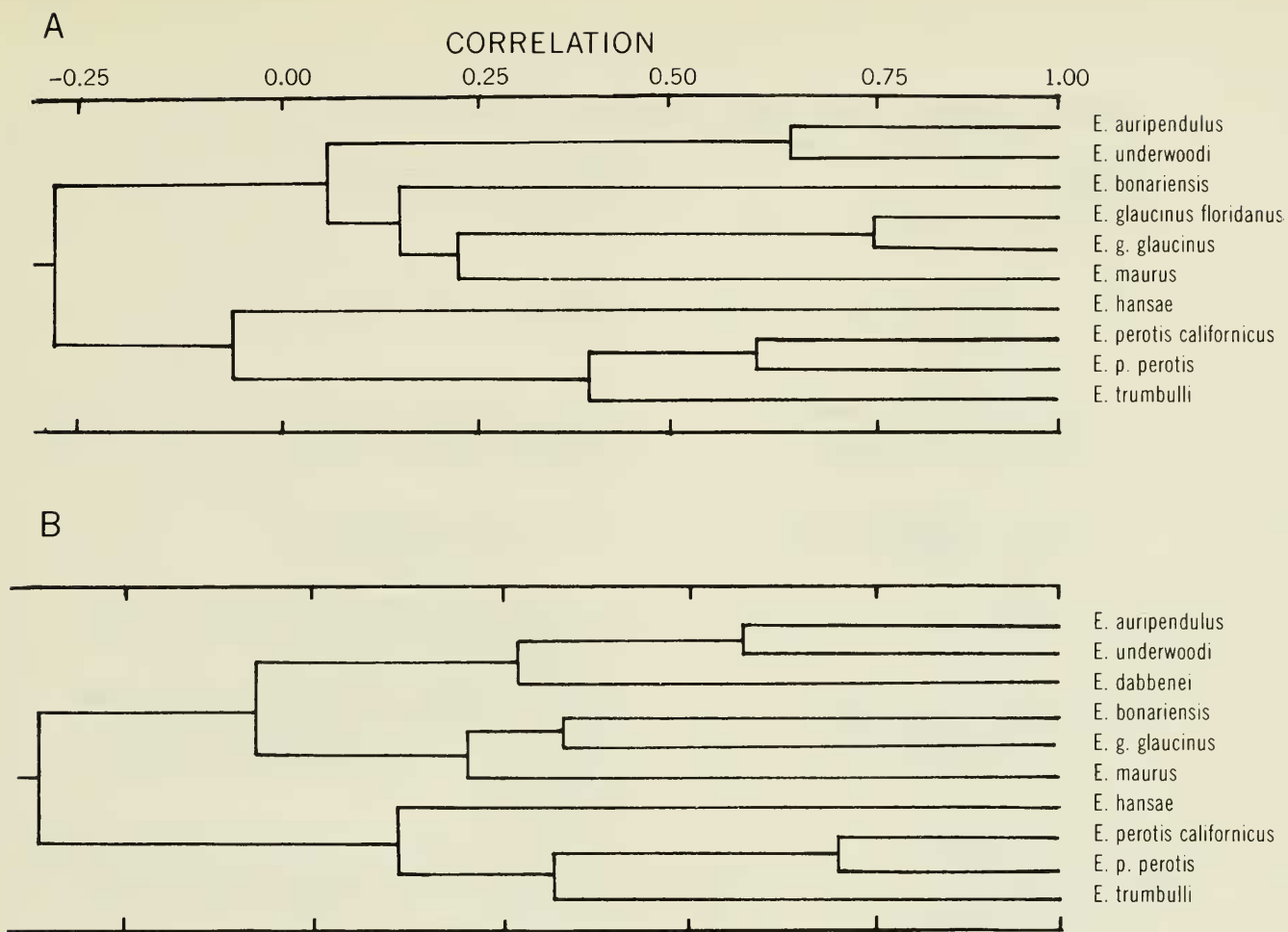


Fig. 8. Phenograms of correlation coefficients divided by forearm length.
 A. Male *Eumops*; cophenetic correlation is 0.89
 B. Female *Eumops*; cophenetic correlation is 0.81

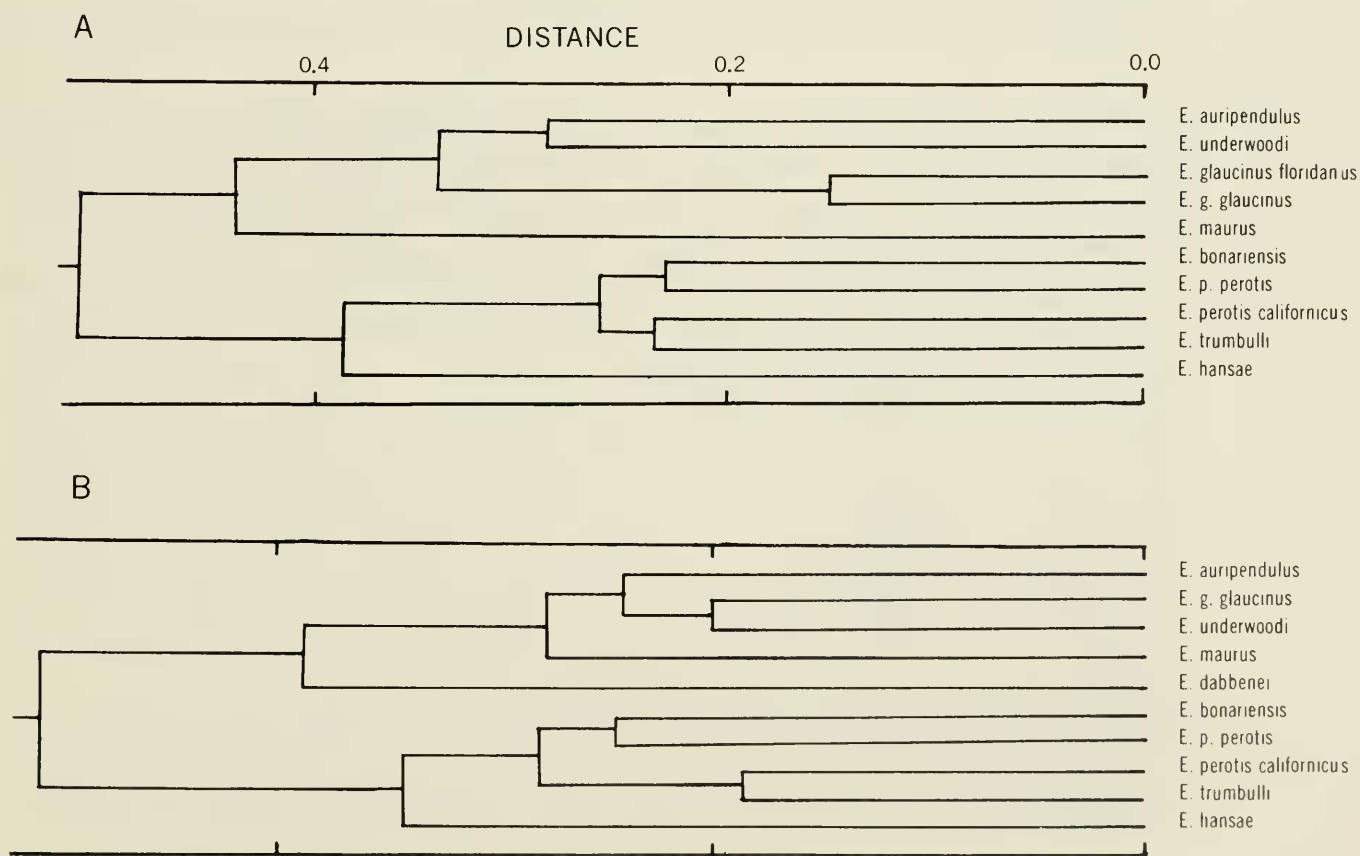


Fig. 9. Phenograms derived from distance matrices with the effect of principal component I removed.
 A. Male *Eumops*; cophenetic correlation is 0.81
 B. Female *Eumops*; cophenetic correlation is 0.83

Table 4. Specimens used to analyze geographic variation in female *Eumops auripendulus*

Sample	Distribution and Number
1. Honduras (HOND) n = 7	Copán (7)
2. Costa Rica (COST) n = 52	Cariblanca (26), Turrialba (26)
3. Panama, western Colombia, and Ecuador (PANA) n = 36	Panama, all localities (21, see Systematic Section); Colombia: Mompós(2), Don Diego(6), Barbacoas(5); Ecuador: Balzar (1), Río Mongoya (1)
4. Eastern Colombia (COLE) n = 10	Guicaramo (3), Villavicencio (7)
5. Northern Venezuela (VENZ) n = 8	Río Yaracuy (4), Parapara (1), San Fernando de Atabapo (2), Lagunillas (1)
6. Guyana, French Guiana, Surinam and southern Venezuela (GUYA) n = 34	Guyana: Kanashen (1), Arakaka (18); French Guiana: Cayenne (2); Surinam: Slootwijk (1), Paramaribo (1), Alalapadoo (4); Venezuela: El Dorado (7)
7. Peru (PERU) n = 12	Peru: Hacienda San Antonio (2), Tingo María (1), Vista Alegre (1), Perené (4), Guayabamba (4)
8. Acre (ACRE) n = 10	Brazil: Acre (10)
9. Argentina, southern and eastern Brazil (ARGT) n = 10	Argentina (3); Brazil: Baturité (1), Quixadá (1), Santa Teresa (1), Iporanga (1), Itapetininga (1), Jaquia (1), São Paulo (1)
10. Brazil (AMAZ) n = 8	Lake Tefé (3), Faro (5)

the first five eigenvalues explain statistically significant amounts of variation among localities and accounted for 88.66 per cent of the variation. Three discriminant axes account for 76.56 per cent and therefore provide a reasonable dimensionality in which interlocality similarities could be assessed.

The discriminant diagrams for *E. auripendulus* (Fig. 10 and 11) demonstrate that phenetic relationships among localities approximate what would be expected from the geographic position of localities, i.e., three major groups. The most northern localities, Honduras and Costa Rica, are isolated from a second group consisting of Panama and northern South America and a third of southern and eastern Brazil and Argentina. In the second group, Guyana, Peru, and Panama are separate from Acre, Brazil. Discriminant function I is a size axis and explains the greatest amount of interlocality variation. Along this axis there is a north-south cline of increasing size among populations, although Acre is an exception to this trend. There is a clear separation of Acre and Argentina from all other localities on discriminant functions I and III (Fig. 11).

Inspection of character vectors indicates that populations of *E. auripendulus* from Brazil and Argentina differ from the remaining populations by larger condylobasal and condyloincisive lengths, and smaller zygomatic width. Bats

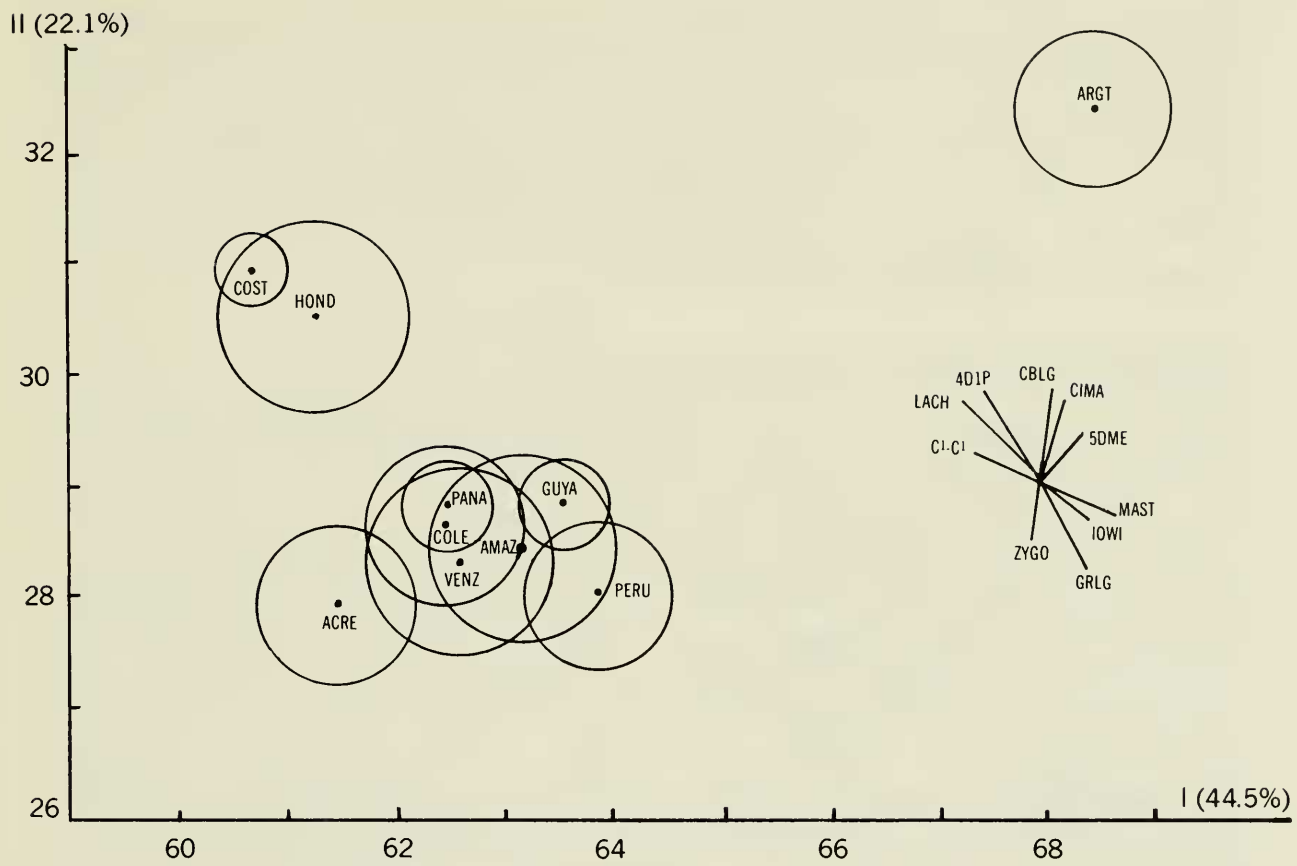


Fig. 10. Discriminant functions I and II of female *E. auripendulus*. See Table 4 for explanation of abbreviations.

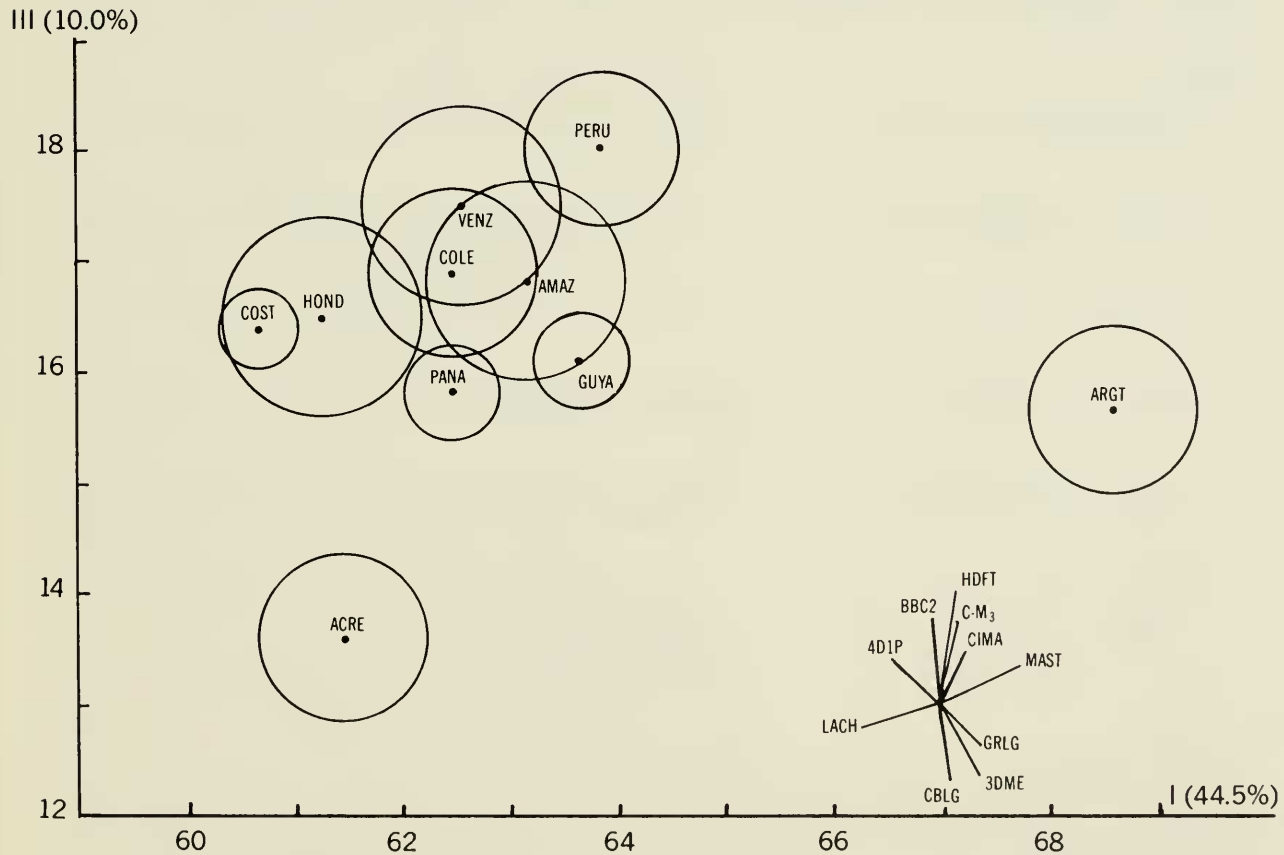


Fig. 11. Discriminant functions I and III of female *E. auripendulus*. See Table 4 for explanation of abbreviations.

from Costa Rica and Honduras differ from the remaining populations (except Argentina) on the basis of wider lacrimal width, width across canines, and longer fourth digit first phalanx, with shorter skull length. There is phenetic separation on the third axis among localities that overlap on the first and second axes. Acre differs from all other localities by smaller hindfoot and condylobasal length and a narrower braincase. A broader mastoid width distinguished Argentina from all other geographic entities.

Geographic Variation in *Eumops glaucinus*

Female *Eumops g. glaucinus* were divided into nine locality samples (Table 5). Multivariate analysis of variance indicates that significant differences exist among localities (F transformation of Wilks' lambda = 4.09, d.f. = 296 and 746, $P < 0.001$). In the discriminant functions analysis the first six eigenvalues explain statistically significant amounts of variation among localities and account for 95.8 per cent of variation. For illustrative purposes, only the first three axes were used, collectively accounting for 79.96 per cent of the total variation (Fig. 12 and 13). The projection of locality centroids on the first and second axes produced three discrete groups. The most northerly consists of northern and southern Mexico and Costa Rica, the second consists of Cuba, Guyana, northern Colombia, and Peru, and the third of northern Venezuela and eastern Colombia. Inspection of character vectors indicates that populations of

Table 5. Specimens used to analyze geographic variation in female *Eumops glaucinus*

Sample	Distribution and Number
1. Northern Mexico (MEXN) n = 12	Pueblo Juárez area (8), La Jala (2), La Sidra (1), Río Armería (1)
2. Southern Mexico (MEXS) n = 14	Ortiz Rubio (2), Rancho San Fernando (3), Tonalá (5), Cintalapa (1), Jesús Carranza (3)
3. Costa Rica (COST) n = 16	Cariblanca (1), Santa Ana (15)
4. Northern Colombia (COLN) n = 14	Sincelejo (7), Santa Marta (4), Espinal (1), Honda (2)
5. Eastern Colombia and western Venezuela (COLL) n = 34	Colombia: El Yopal (2), Puerto López (4); Venezuela: San Juan (28)
6. Northern Venezuela (VENZ) n = 12	Montalbán (2), Río Tocuyo (3), San Felipe (6), Zulia (1)
7. Guyana (GUYA) n = 12	Aroquoi tributary (7), Achamere Wau (5)
8. Peru (PERU) n = 8	Peru: Suyu (8)
9. Cuba (CUBA) n = 16	All localities. See Systematic Section

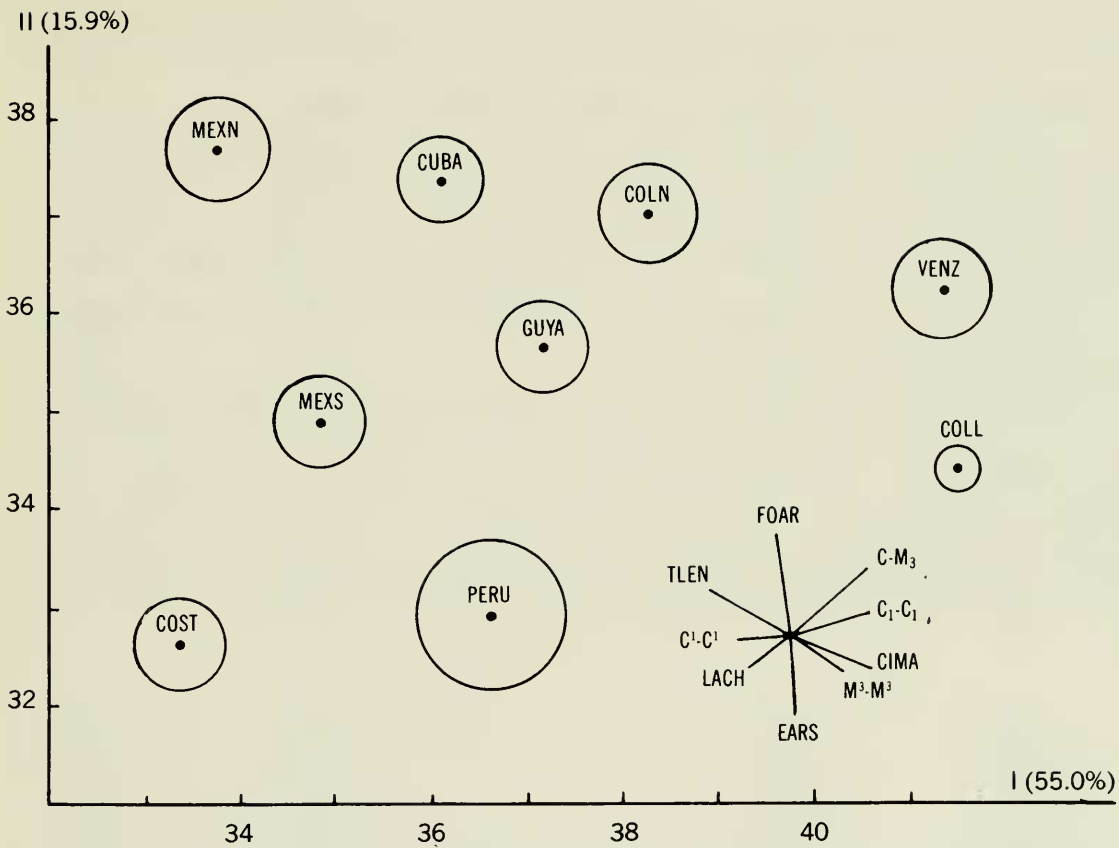


Fig. 12. Discriminant functions I and II of female *E. glaucinus*. See Table 5 for explanation of abbreviations.

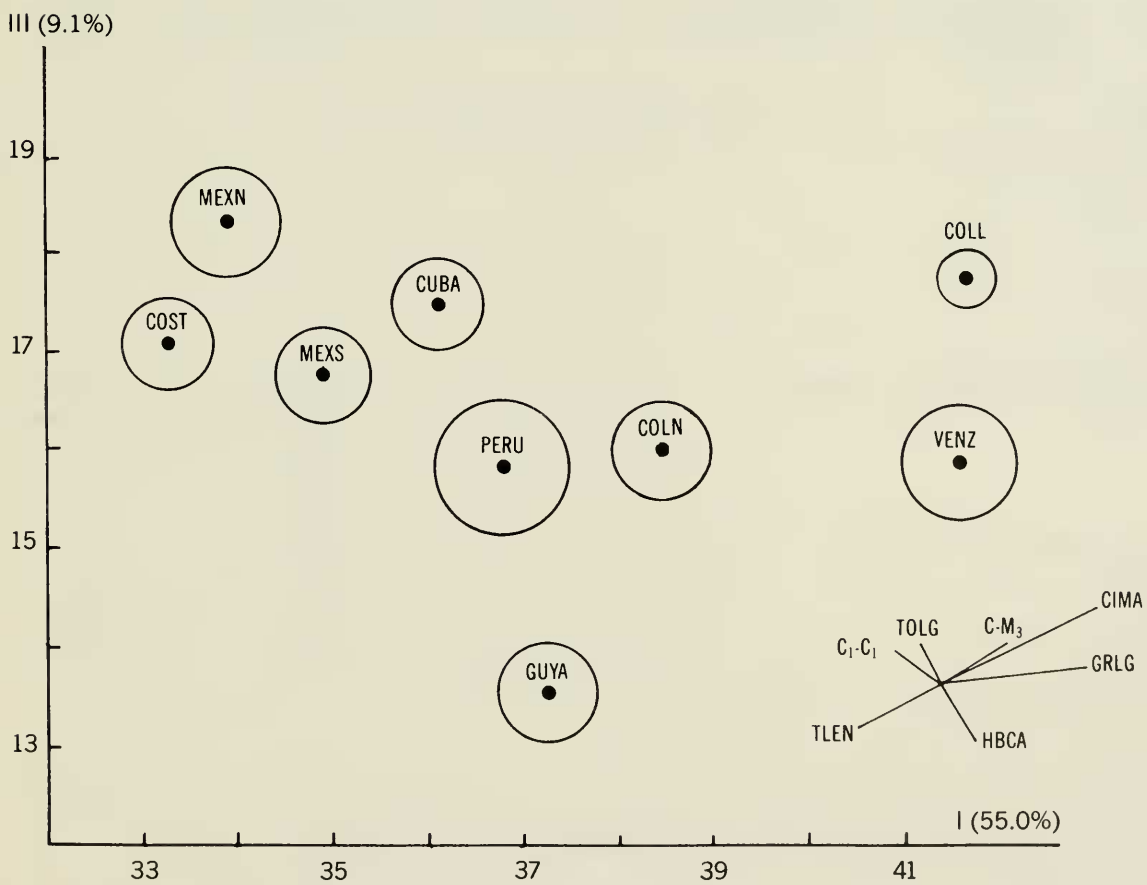


Fig. 13. Discriminant functions I and III of female *E. glaucinus*. See Table 5 for explanation of abbreviations.

E. glaucinus from Venezuela and Colombia are larger than the remaining populations in mandible length and width, whereas northern Mexico, Cuba, and northern Colombia are larger in forearm and body lengths.

The northernmost localities (Mexico north and south, Costa Rica, and Cuba) are separate from other localities on discriminant functions I and III (Fig. 13). Peru and Colombia form a second group. Character vectors indicate that bats from Mexico, Costa Rica, and Cuba have long skull lengths and wide canine-canine widths and narrower braincases. Long mandibles characterize populations from Colombia and Venezuela.

Specimens of male *E. glaucinus* were divided into eight locality samples (Table 6). In results of SS-STP analyses of five characters (Fig. 14), *E. glaucinus floridanus* is always significantly different from all other localities. In four of five characters, the samples from Colombia, Venezuela, and Cuba are combined in non-significant subsets. The samples from Costa Rica and Honduras are in the same non-significant subset, with the exception of forearm length.

Table 6. Specimens used in SS-STP analyses of geographic variation in male *Eumops glaucinus*

Sample	Distribution and Number
1. Florida (FLOR) n = 21	Miami (21)
2. Colombia (COLM) n = 6	Sincelejo (2), Puerto Salgar (1), Honda (3)
3. Venezuela, eastern Colombia and Guyana (VENZ) n = 27	Venezuela: San Jaun (10), Maripa (1), Caracas (1), Chichiriviche (1), Río Tocuyo (1), Cumaná (1), San Felipe (3); Colombia: Puerto López (3), Restrepo (2); Guyana: Aroquoi tributary (1), Achamere Wau (1), Rewa River (2)
4. Peru and Ecuador (PERU) n = 8	Perú: Suyo (6); Ecuador: Guayaquil (2)
5. Mexico (MEXI) n = 6	Palenque (1), Rancho San Fernando (1), Las Juntas (2), Pueblo Juárez (1)
6. Costa Rica (COST) n = 8	Cariblanca (1), Turrialba (1), Santa Ana (6)
7. Honduras and Nicaragua (HOND) n = 5	Honduras: Comayagua (2), La Paz (2); Nicaragua: Yalaquina (1)
8. Cuba (CUBA) n = 16	All localities. See Systematic Section.

	\bar{X}			\bar{X}	
FLOR	64.27	I	FLOR	18.53	I
HOND	60.82	I	VENZ	17.32	I
CUBA	60.56	I	COLM	17.16	II
COLM	60.31	II	CUBA	16.97	II
MEXI	60.11	II	PERU	16.96	III
VENZ	59.12	I	MEXI	16.62	II
COST	58.82	I	HOND	16.39	II
PERU	58.72	I	COST	16.31	I

A

B

	\bar{X}			\bar{X}	
FLOR	25.52	I	FLOR	16.40	I
COLM	23.96	I	VENZ	14.93	I
VENZ	23.87	I	COLM	14.69	II
CUBA	23.41	II	MEXI	14.67	III
PERU	23.35	II	CUBA	14.62	IIII
MEXI	23.35	I	COST	14.17	III
HOND	23.12	I	HOND	14.15	II
COST	22.91	I	PERU	14.13	I

C

D

	\bar{X}	
FLOR	10.88	I
VENZ	10.41	I
COLM	10.23	II
CUBA	10.04	III
MEXI	9.95	III
PERU	9.82	III
COST	9.62	II
HOND	9.58	I

E

Fig. 14. Results of five SS-STP analyses (A. forearm length, B. condyloincisive length, C. condylobasal length, D. zygomatic width, and E. width across third molars) of geographic variation of male *Eumops glaucinus*. Vertical line to the right of each array of means connect maximally non-significant subsets at the 0.05 level. See Table 6 for explanation of abbreviations.

Discussion

The R-mode principal component analysis is useful to illustrate affinities because it does not assume hierarchical relationships among OTUs. The results of the PCA closely compare with the distance phenograms, illustrating size relationships of the OTUs. The results of PCA of characters/forearm are complementary to the distance/forearm and correlation phenograms, and the minimum spanning tree clarifies the positions of *E. maurus*, *E. bonariensis*, and *E. dabbenei*.

Five Q-mode clustering techniques were used to provide multiple phenetic classifications. Because the complements of OTUs studied differ for males and females, results might be expected to differ for the sexes. The addition or removal of an OTU from a Q-mode similarity matrix causes differences in the composition of the matrix and therefore accounts for discrepancies between phenograms of males and females. The clusters from the distance matrices are based largely on size. For example, *E. glaucinus* and *E. auripendulus* (two species of similar size) cluster together, but are distinct species on other criteria. When the distance matrices are divided by forearm, OTUs of similar shape and size cluster together. Conversely, the phenogram produced from the correlation matrix based on characters/forearm is similar to the correlation phenogram based on raw characters, and both phenograms have clusters similar in composition to the distance/forearm. The latter has a much higher cophenetic correlation and consequently best represents phenetic relationships within the genus. Removing principal component I from the distance matrix not only eliminates size but may also remove any shape related to size, and the resulting phenogram is different. Similarly, Robins and Schnell (1971) found that where size was unchecked or eliminated, phenograms were more divergent than those obtained from other methods.

Sokal and Michener (1967), Schnell (1970), and Robins and Schnell (1971) found that correlations tend to give more uniform results than distances when differently treated sets of data are analyzed for the same OTUs. But because of the minimum distortion given by the distance/forearm phenograms in this study, these phenograms best represent the phenetic relationships in the genus.

Geographic Variation

Eumops auripendulus

The discriminant functions analysis demonstrates that phenetic relationships among localities approximate what would be expected from the relative geographic position of localities. Samples from Costa Rica and Honduras are homogeneous, as are samples from Panama and northern South America. The sample from Argentina represents a phenetically distinct group within the species. Specimens of *E. auripendulus* from eastern Brazil and Argentina were compared with *E. auripendulus* from the adjacent Amazon region of Brazil and were found to be statistically significantly different in 31 of 38 characters (Eger, 1974). Conversely, population differences between Central and northern South American populations are clinal and appear to lack discontinuities.

A lowland forest occurs from the Isthmus of Tehuantepec southeast across

the Yucatan Peninsula through Central America to South America and continues southward to the Pacific lowlands of Colombia to northern Ecuador (Haffer, 1969). Samples from Peru and the Amazon region of Brazil are phenetically similar, probably because there is no barrier to gene exchange, for Peruvian specimens distributed east of the Andes are situated in a region that is part of the Amazon basin. *E. a. auripendulus* is therefore confined to lowland rain forest except in Peru, where it occurs in upland rain forest. *E. a. major* occurs in an area of upland semideciduous forest, which is isolated by a large savanna and scrub forest from the Amazonian rain forest. The presence of this upland semideciduous forest could account for the isolation of the eastern population. Or perhaps, as Haffer (1969) suggested, the forest refugia in central South America were instrumental in this isolation.

Eumops glaucinus

The discriminant functions analysis demonstrates that populations of *E. glaucinus* are isolated from each other, as 95 per cent confidence circles indicate significantly different populations. The northern Mexican population is isolated from the southern Mexican population by the Sierra Madre del Sur. Because *E. g. glaucinus* occurs in the Greater Antilles but not in the Lesser Antilles, I assume that populations on Cuba and Jamaica were derived from Central rather than from South America. The position of Cuban bats in a cluster with Mexican bats suggests that Cuban populations may have been derived from Mexican *E. glaucinus*. During the Tertiary and Quaternary, climatic and geologic events probably affected dispersion of this bat. Fluctuations in sea level caused a restriction or expansion of landmass, and the latter would have resulted in a narrower gap between Cuba and the Yucatan Peninsula and also between Jamaica and the Honduran-Nicaraguan region (Darlington, 1957). A more recent explanation for the distribution of *E. glaucinus* comes from Rosen (1975), who suggested that as there is no evidence of a close relationship between the Antilles and Florida populations, a vicariant event causing the subdivision of the species range could have occurred in the Gulf coastal region of North America and Mexico.

The Florida population of *E. glaucinus floridanus* is isolated from *E. g. glaucinus* and has probably been isolated for considerable time. The single known fossil specimen of *E. g. floridanus* is probably Pleistocene in age and is indistinguishable from present Florida representatives (Koopman, 1971).

Results of SS-STP do not indicate any apparent north-south cline but rather two subsets – Peru, Costa Rica, and Honduras as one group and Colombia, Venezuela, and Cuba as another. Warner *et al.* (1974) described three karyotypes for *E. glaucinus*. Specimens from Puerto Lopez, Colombia, possessed a diploid number of 40, whereas those from Mexico, Honduras, and Costa Rica had a diploid number of 38. They also demonstrated dimorphism in a pair of chromosomes about the size of the X-chromosome of *E. g. glaucinus* but were unable to determine if races were involved, or if it was widely distributed polymorphism as was found in *Mimon* (Baker *et al.*, 1972b). Statistical analyses indicate that *E. glaucinus* is a polytypic species consisting of several isolated populations.

Systematic Section

Eumops Miller, 1906

Vespertilio Shaw, 1800: 137 (non *Vespertilio* Linnaeus, 1758).

Molossus Schinz, 1821: 870 (non *Molossus* Geoffroy, 1805).

Dysopes Wied, 1826: 226 (non *Dysopes* Illiger, 1811).

Promops Peters, 1874: 232 (non *Promops* Gervais, 1855).

Type Species

Molossus californicus Merriam, 1890.

Distribution

Generally below 3,000 metres, throughout the Americas from southern regions of California, Arizona, Texas, and Florida, south through Middle America to central Argentina; and Cuba, Jamaica, and Trinidad.

Diagnosis

Bats of this genus differ greatly in size, with lengths of forearms ranging from 37 in *Eumops bonariensis* to 83 in *E. perotis*. Externally distinguished from other genera in the family Molossidae by large rounded pinnae joined medially on the forehead; tragus reduced, square or pointed; antitragus large, semiovate; ear keel greatly developed; smooth upper lips; skull cylindrical with well-developed basisphenoid pits; a single pair of curved upper incisors; palate slightly arched. Dental formula is $\frac{1}{2}$, $\frac{1}{1}$, $\frac{2}{2}$, $\frac{3}{3}$, but occasionally first upper premolars are reduced to $\frac{1}{2}$; molars with typical w-pattern; M³ with third commissure variable in development.

Eumops auripendulus (Shaw, 1800)

Vespertilio auripendulus Shaw, 1800: 137 (non *Vespertilio* Linnaeus, 1758).

Molossus rufus Geoffroy, 1805: 155 (non *Molossus* Geoffroy, 1805: 151).

Molossus amplexi-caudatus Geoffroy, 1805: 156 (non *Molossus* Geoffroy, 1805: 151).

Dysopes longimanus Wagner, 1843: 367 (non *Dysopes* Illiger, 1811).

Dysopes leucopleura Wagner, 1843: 367 (non *Dysopes* Illiger, 1811).

Molossus nasutus J. A. Allen, 1897: 115 (non *Molossus nasutus* Spix, 1823).

Promops milleri J. A. Allen, 1900: 92 (non *Promops* Gervais, 1855).

Promops barbatus J. A. Allen, 1904: 228 (non *Promops* Gervais, 1855).

Eumops abrasus Miller, 1906: 85 (non *Dysopes abrasus* Temminck, 1827).

Eumops milleri Miller, 1906: 85.

Eumops maurus Villa R., 1956: 543 (non *Molossus maurus* Thomas, 1901).

Eumops auripendulus Goodwin, 1960: 5.

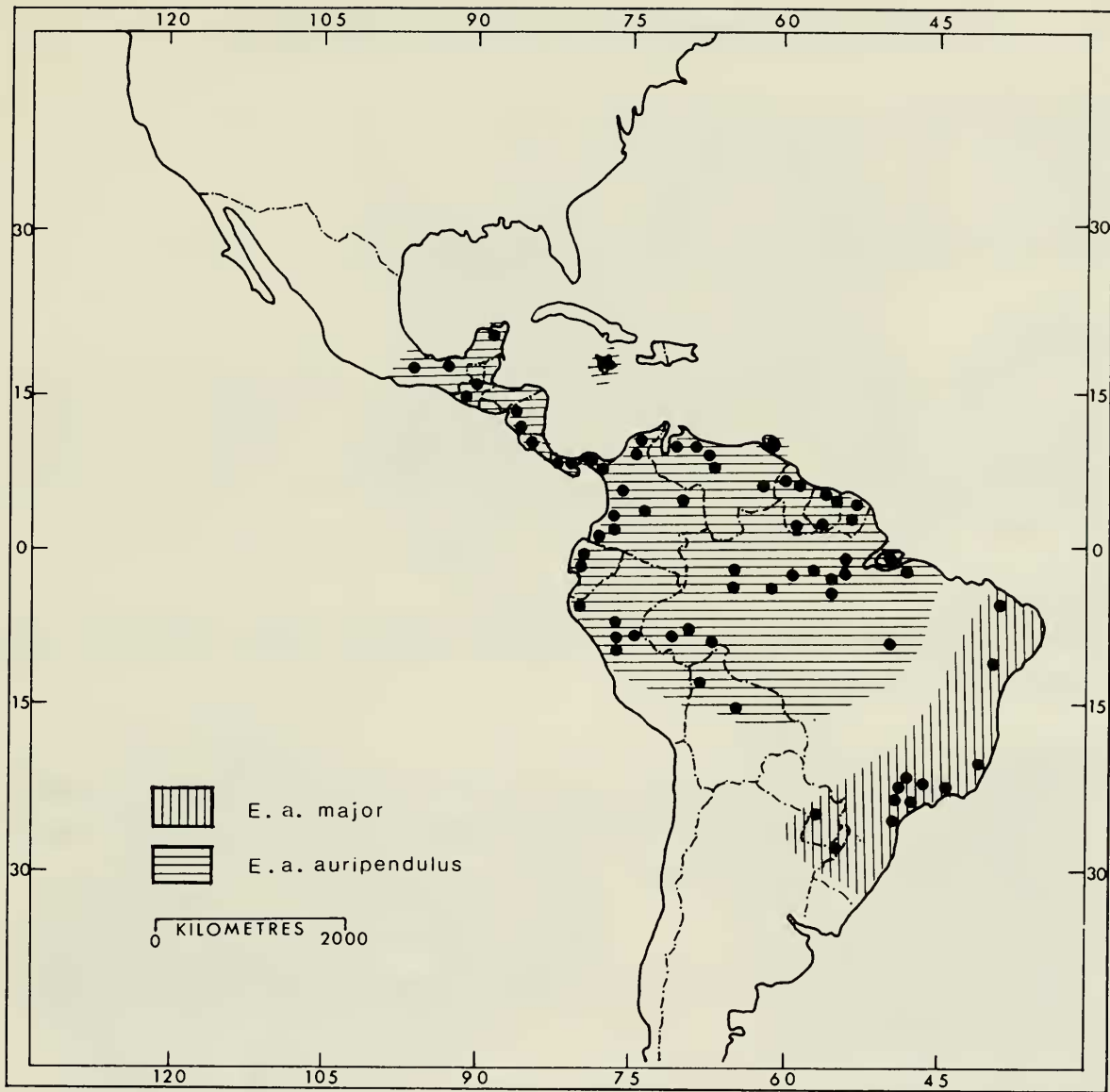


Fig. 15. Distribution of *Eumops auripendulus*. See Systematic Section for list of localities.

Distribution

Southern Mexico south to northern Argentina (Fig. 15).

Diagnosis

Size, medium; forearm length, 55 to 68; colour, Blackish Brown to dark Chestnut-Brown; third commissure of M³ rudimentary.

Differential Diagnosis

Similar in size to *Eumops glaucinus* but differs by dark colour; pointed tragus; smaller, more shallow basisphenoid pits; skull shorter, less robust, with proportionally narrower widths of mastoid and postorbital constriction.

Eumops auripendulus auripendulus (Shaw, 1800)

Eumops abrasus milleri Sanborn, 1932: 352.

Eumops abrasus oaxacensis Goodwin, 1956: 2.

Eumops a. auripendulus Husson, 1962: 240.

Eumops auripendulus oaxacensis Goodwin, 1969: 112.

Eumops auripendulus oaxacensis Jones *et al.*, 1973: 26.

Holotype

No holotype originally designated. First named the slouch-eared bat by Pennant (1793) from a description and drawing given by Buffon (1789). Subsequently Shaw (1800) renamed this species *Vespertilio auripendulus*. Goodwin (1960) clarified the status of *E. auripendulus*, and Husson (1962) restricted the type locality to French Guiana.

Distribution

Southern Mexico south to Bolivia and the Amazon region of Brazil; and Jamaica and Trinidad (Fig. 15).

Diagnosis

See Fig. 16 and Table 7. Tragus small and pointed, about 2 mm long; dorsal fur Blackish Brown to dark Chestnut-Brown, paler basal band; ventral pelage paler; basisphenoid pits moderately well developed, shallow.

Differential Diagnosis

Smaller than *Eumops auripendulus major*, distinguished by shorter forearm and condylobasal lengths.

Specimens Examined and Distribution Records

BOLIVIA. Beni: Camiaco, 16 km N Limoquique (=Limoquije) 15°15'S 64°46'W, 1 (AMNH). La Paz: Ixiamas, 13°45'S 68°10'W, 1 (USNM). BRAZIL. No locality, 29 (MCZ). Lake Hyanuary, 1 (MCZ). Acre: Plácido de Castro, 10°20'S 67°11'W, 10 (USP); Tarauacá, 8°10'S 70°46'W, 1 (USP). Amazonas: Lagoa

Table 7. Selected sample statistics of *Eumops a. auripendulus*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	74	58.64	0.15	214	58.34	0.09
TOLG	43	25.12	0.08	133	24.74	0.04
CBLG	39	23.14	0.08	128	22.77	0.04
ZYGO	43	14.32	0.05	140	14.11	0.03
MAST	39	12.28	0.05	132	12.17	0.02
HBCA	39	8.70	0.04	129	8.53	0.03
C-M ³	47	9.51	0.03	150	9.36	0.02
POCO	44	4.52	0.03	143	4.50	0.01

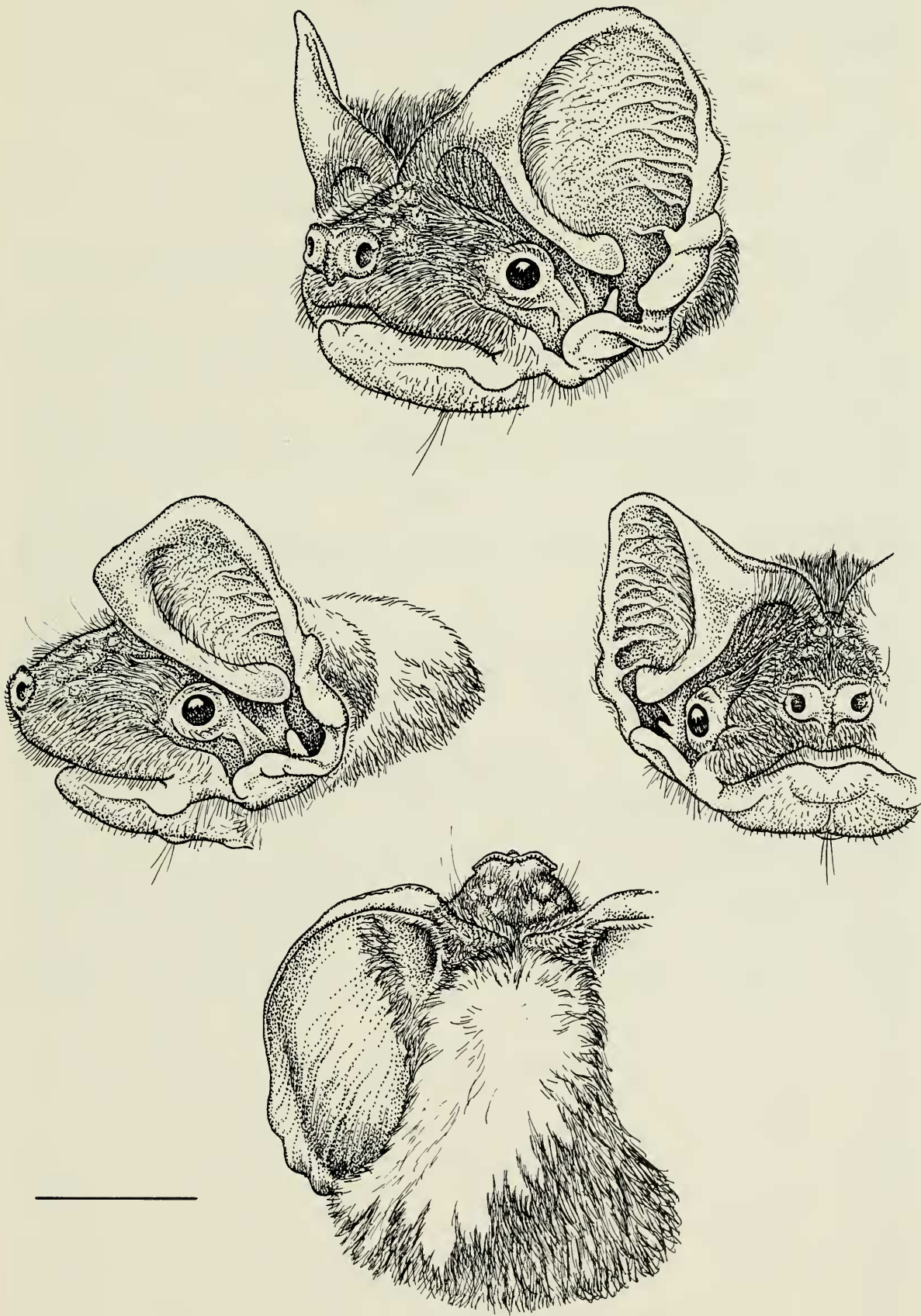


Fig. 16. *Eumops a. auripendulus*. Scale bar = 10 mm.

Anamã, Tacambú, 2°35'S 64°40'W, 1 (BMNH); Xingu, 7°48'S 68°45'W, 3 (LACM); Manacapuru, 3°18'S 60°37'W, 1 (BMNH); mouth of Lake Tefé, 3°27'S 64°47'W, 4 (AMNH). Mato Grosso: São Domingos, Rio das Mortes, 11°45'S 50°44'W, 1 (USP). Pará: Boim near Rio Tapajós, 2°49'S 55°10'W, 2 (USP); Pará (Belém), 1°27'S 48°29'W, 1 (MCZ); Faro, 2°10'S 56°39'W, 7 (AMNH); Rio Tapajós, Limoãl, 2°24'S 54°41'W, 1 (AMNH); Morcêgo, 0°58'S 52°40'W, 1 (USP); Santarém, 2°26'S 54°41'W, 2 (MNHN). BELIZE. Rockstone Pond, 17°46'N 88°22'W, 1 (ROM). COLOMBIA. Antioquia: Medellín, 6°15'N 75°36'W, 1 (BMNH). Bolívar: Mompós, 9°15'N 74°35'W, 2 (USNM). Cauca: Popayán, 2°27'N 76°22'W, 1 (ROM). Magdalena: Don Diego, 11°00'N 73°43'W, 10 (CM). Meta: Guiacaramo, 4°35'N 73°00'W, 4 (MCZ), 1 (AMNH); Villavicencio, 4°09'N 73°38'W, 1 (ROM), 2 (FMNH), 4 (AMNH). Nariño: Barbacoas, 1°38'N 78°08'W, 8 (AMNH). Valle del Cauca: Puerto Merizalde, 3°16'N 77°25'W, 1 (USNM). COSTA RICA. Alajuela: Cariblanca, 18 km NE Naranjo, 9°56'N 84°57'W, 15 (TCWC). Cartago: Turrialba, 9°56'N 83°40'W, 11 (LACM), 2 (KU), 32 (TCWC). Puntarenas: Villa Neily, 10°N 84°50'W, 2 (LACM); San José, 9°59'N 84°04'W, 1 (KU). ECUADOR. Guayas: Balzar, 1°25'S 79°54'W, 1 (MNHN). Manabí: Río Mongoya, 0°10'S 79°38'W, 3 (FMNH). EL SALVADOR. Chilata: Sonsonate, 13°43'N 89°44'W, 1 (MVZ). FRENCH GUIANA. Cayenne, 4°55'N 52°18'W, 2 (MNHN), 1 (USP); Saül, 3°32'N 53°15'W, (Brosset et Dubost, 1967). GUATEMALA. Cobán, 15°28'N 90°21'W, 1 (BMNH). Mazatenango (Finca Cipres), 14°31'N 91°30'W, 1 (AMNH). GUYANA. Demerara: Demerara (Georgetown), 6°46'N 58°10'W, 1 (BMNH). Essequibo: Rupununi, Kanashen, 1°45'N 58°30'W, 1 (ROM). North West District: Arakaka, 7°35'N 60°07'W, 26 (AMNH); Mt. Everard, 3 (AMNH). HONDURAS. Copán: Copán (Ruinas de Copán), 14°52'N 89°10'W, 9 (TCWC). 7 km N Santa Bárbara, 14°56'N 88°11'W, 1 (TCWC). JAMAICA. no locality, 1 (BMNH); Kingston 17°58'N 76°48'W, 1 (IJ); St. Ann Parish, Queenhythe, 18°20'N 77°25'W, 2 (TTU). MEXICO. Oaxaca: Mazatlán, District of Mixes, 17°02'N 95°25'W, 1 (AMNH). Quintana Roo: 16 km from Yucatan Border, 1 (UNAM). Tabasco: Teapa, 18°35'N 92°56'W, 1 (BMNH). NICARAGUA. Mecatepe, 11°58'N 85°59'W, 1 (USNM). 1.5 km SE Yalaguina, 13°20'N 86°30'W, 1 (TCWC). PANAMA. Bocas del Toro: 7 km SSW Changuinola, 9°28'N 82°31'W, 1 (USNM). Canal Zone: Bohío, 9°10'N 79°51'W, 13 (USNM); Empire, 9°04'N 79°40'W, 1 (USNM); Fort Clayton (Fort Kobbe), 9°00'N 79°35'W, 2 (USNM); Frijoles, 9°11'N 79°48'W, 1 (USNM); Gamboa, 9°08'N 79°42'W, 1 (MVZ); Panama City, 8°57'N 79°30'W, 1 (MCZ); Paraiso, 9°02'N 79°38'W, 1 (USNM); Summit, 9°04'N 79°39'W, 1 (USNM). Darién: Tacarcuna Village, 8°05'N 77°17'W, 1 (USNM). Panamá: Tapia, 9°04'N 79°25'W, 5 (MCZ). PERU. Huánuco: Hacienda San Antonio, Río Chinchao, 9°30'S 75°56'W, 2 (FMNH); 3.2 km N Tingo María, 9°09'S 75°56'W, 1 (TCWC); Vista Alegre, 9°55'S 76°11'W, 2 (FMNH). Junín: Perené, 10°55'S 75°15'W, 5 (USNM). Loreto: Pucallpa, 8°23'S 74°32'W, 1 (FMNH). Piura: 6.4 km W Suyo, 4°33'S 80°01'W, 2 (TCWC). San Martín: Guayabamba (Santa Rosa de Huayabamba), 6°22'S 77°25'W, 4 (AMNH). SURINAM. Commewijne: Sloopwijk, 5–6°N 55°W, 1 (RMNH). Nickerie: Alalapadoo, N of Sipaliwini R., 2°30'N 56°W, 6 (ROM). Plantation Wederzorg, not located, 1 (USNM). Surinam: no locality, 1 (USNM); Paramaribo, 5°52'N 55°14'W, 2 (RMNH); Welgedacht C, S of Paramaribo, 1 (RMNH). TRINIDAD. Blanchisseuse, 10°47'N 61°18'W, 1 (USNM). Maracas

Valley, 10°41'N 61°24'W, 2 (TTU); Port of Spain, 10°38'N 61°31'W, 1 (TTU). VENEZUELA. Amazonas: San Fernando de Atabapo, Upper Orinoco River, 4°03'N 67°42'W, 2 (AMNH). Bolívar: El Dorado, Río Cuyuni, 6°45'N 61°37'W, 9 (AMNH). Carobobo: 10 km NW Urama, Río Yaracuy, 10°30'N 68°19'W, 4 (USNM). Guárico: Parapara, 9°44'N 67°18'W, 1 (USNM). Zulia: Lagunillas, 10°08'N 71°16'W, 1 (FMNH).

Eumops auripendulus major Eger, 1974

Eumops auripendulus major Eger, 1974: 2.

Holotype

ROM 50196 adult male; Campo Viera, Misiones, Argentina.

Distribution

Northern Argentina, southern Paraguay, and eastern Brazil (Fig. 15).

Diagnosis

Tragus shape and pelage colour similar to *E. a. auripendulus*. See Table 8 for selected means.

Differential Diagnosis

Larger than *E. a. auripendulus*, with longer forearm and condylobasal lengths. See Tables 7 and 8.

Specimens Examined and Distribution Records

ARGENTINA. Misiones: no locality, 1 (ROM); Bonpland, 27°30'S 56°00'W, 1 (ROM); Campo Viera, 27°15'S 55°10'W, 2 (ROM); Colonia Mártieres, approx. 28°S 56°W, 2 (ROM). BRAZIL. Bahia: Lamarão, 11°46'S 38°53'W, 1 (BMNH). Ceará: Baturité, 4°20'S 38°53'W, 1 (FMNH), 1 (USP); Quixadá, 4°48'S 39°01'W, 2 (FMNH). Espírito Santo: Santa Teresa, 19°55'S 40°36'W, 1 (USP). Minas Gerais: Manejo, 21°50'S 45°44'W, 2 (MCZ). São Paulo: Butantã, 1 (USP); Emas Pirasununga, 21°56'S 47°22'W, 1 (USP); Iporanga, 24°35'S 48°35'W, 1 (MCZ);

Table 8. Selected sample statistics of *Eumops auripendulus major*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	8	64.2	0.70	10	63.4	0.47
TOLG	6	27.2	0.23	8	26.6	0.29
CBLG	6	25.0	0.15	8	24.8	0.19
ZYGO	6	15.4	0.10	8	15.1	0.11
MAST	5	13.1	0.15	8	13.0	0.12
HBCA	6	9.2	0.07	8	8.9	0.10
C-M ³	6	10.3	0.12	9	10.1	0.08
POCO	6	4.7	0.06	9	4.9	0.07

Itapetininga, 23°36'S 48°07'W, 1 (MCZ); Juquiá, 24°19'S 47°38'W, 1 (USP);
Ribeirão Preto, 21°10'S 47°48'W, 4 (USP); São Paulo, 23°33'S 46°39'W, 1
(USP). PARAGUAY. Central: Recoleta, Asunción, 25°15'S 57°40'W, 3 (MVZ).

Eumops bonariensis (Peters, 1874)

Promops bonariensis Peters, 1874: 232–34 (non *Promops* Gervais, 1855).

Molossus bonariensis Dobson, 1876: 715 (non *Molossus* Geoffroy, 1805).

Eumops bonariensis Miller, 1906: 85.

Eumops patagonicus Thomas, 1924: 234.

Distribution

Southern Mexico to central Argentina (Fig. 17).

Diagnosis

Smallest of the genus, forearm 37–49; third commissure on M³ as long as second.



Fig. 17. Distribution of *Eumops bonariensis*. See Systematic Section for list of localities.

Eumops bonariensis bonariensis (Peters, 1874)

Eumops b. bonariensis Sanborn, 1932: 354.

Holotype

Whereabouts unknown adult male; Buenos Aires, Argentina.

Distribution

Southern Brazil south to Buenos Aires region of Argentina (Fig. 17).

Diagnosis

Pelage Snuff Brown to Bister dorsally, Buffy Brown ventrally; basisphenoid pits oval and shallow; third commissure of M³ well developed, as long as second commissure. See Table 9 for selected character means.

Differential Diagnosis

Averages larger than *E. bonariensis beckeri*, *E. bonariensis delticus*, and *E. bonariensis nanus* in all characters; distinguished by forearm and condylobasal lengths.

Specimens Examined and Distribution Records

ARGENTINA. Buenos Aires: Delta of Paraná River, approx. 39°S 54°W, 1 (ROM); La Plata, 34°52'S 57°55'W, 1 (BMNH); Punta Lara, 50 km S Buenos Aires, 34°40'S 58°00'W, 1 (ROM). Entre Ríos: Gualeguaychu, 33°03'S 59°31'W, 1 (ROM), 1 (TCWC). BRAZIL. Rio Grande do Sul: Quinta, 32°05'S 52°17'W, 5 (AMNH). URUGUAY. Cerro Largo: Centurión, 32°06'S 53°45'W (Acosta y Lara, 1950). Río Negro: Arroyo Negro River, 15 km S Paysandú, 32°25'S 58°05'W, 8 (AMNH). Treinta-y-tres: Treinta-y-tres, 33°16'S 54°17'W, 1 (FMNH).

Table 9. Selected sample statistics of *Eumops b. bonariensis*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	7	46.81	0.69	7	46.70	0.49
TOLG	7	20.44	0.16	5	20.08	0.17
CBLG	7	19.19	0.17	5	19.01	0.11
ZYGO	7	11.93	0.14	4	11.85	0.13
MAST	7	11.31	0.09	5	11.20	0.06
HBCA	7	7.29	0.07	5	7.22	0.12
C-M ³	7	7.59	0.11	6	7.58	0.10
POCO	7	4.36	0.04	5	4.37	0.07

Eumops bonariensis beckeri Sanborn, 1932

Eumops bonariensis beckeri Sanborn, 1932: 355.

Holotype

FMNH 21536 adult male; Trinidad, El Beni, Bolivia.

Distribution

Bolivia, Paraguay, northern Argentina (Fig. 17).

Diagnosis

See drawing of head (Fig. 18). Pelage Mummy Brown with grey hairs scattered throughout, paler ventrally; basisphenoid pits oval and shallow. Selected character means given in Table 10.

Differential Diagnosis

Similar to *E. b. bonariensis* but smaller, distinguished by shorter forearm and condylobasal lengths. Agrees with the description and measurements of *E. patagonicus* Thomas (1924). Although Cabrera (1957) stated that Chubut is a valid locality for this bat, only additional specimens from this area will establish the true status of *E. b. patagonicus*.

Remarks

Of three specimens of *E. bonariensis* collected 230 km NW of Villa Hayes by road, Depto. Presidente Hayes, Paraguay, two (MVZ 145109, 145110) were typical of *E. bonariensis beckeri*, but the third specimen (MVZ 145108) was intermediate in size between *E. b. bonariensis* and *E. b. beckeri*.

Specimens Examined and Distribution Records

ARGENTINA. No locality, 1 (MNHN). Chaco: Barrangueras, 27°29'S 58°54'W, 1 (ROM); Resistencia, 27°28'S 59°00'W, 14 (BMNH); Sáenz Peña, 26°45'S 68°30'W, 1 (ROM). Corrientes: Goya, 29°10'S 59°15'W, 5 (BMNH). Formosa: Clorinda Borrier, 26°15'S 57°45'W, 1 (ROM). Misiones: Capital Villa Lanus, 27°26'S 55°53'W, 2 (ROM). Salta: Santa Victoria Este, 22°17'S 62°44'W, 3 (ROM). Santiago del Estero: Santa Isabel, 26°20'S 64°20'W, 1 (ROM). BOLIVIA. Beni: Magdalena, Itinez, 13°22'S 64°07'W, 14 (USNM); 20 km S San Joaquín, 13°13'S 64°47'W, 1 (AMNH); Trinidad, 14°46'S 64°50'W, 2 (USNM), 8 (FMNH), 1 (MCZ), 4 (AMNH), 8 (UNAM). PARAGUAY. Chaco: Loma Plata, Menno Colony, 22°20'S 60°W, 2 (KU); Teniente Ochoa, 21°42'S 61°02'W (Wetzel and Lovett, 1974). Concepción: 8 km E Concepción, 23°22'S 57°22'W, 1 (MVZ). Guaira: Villarrica, 25°45'S 56°28'W, 1 (USNM), 1 (AMNH). Itapuá: Encarnación, 27°20'S 55°50'W, 1 (MVZ). La Cordillera: Asunción, 25°15'S 57°40'W, 13 (USNM), 3 (AMNH), 2 (ROM), 3 (FMNH), 8 (MVZ). Paraguari: Sapucay, 25°40'S 56°55'W, 4 (BMNH). Presidente Hayes: 275 km NW Villa Hayes by road, 25°10'S 58°30'W, 10 (MVZ); 230 km NW Villa Hayes by road, 23°25'S 58°30'W, 2 (MVZ).

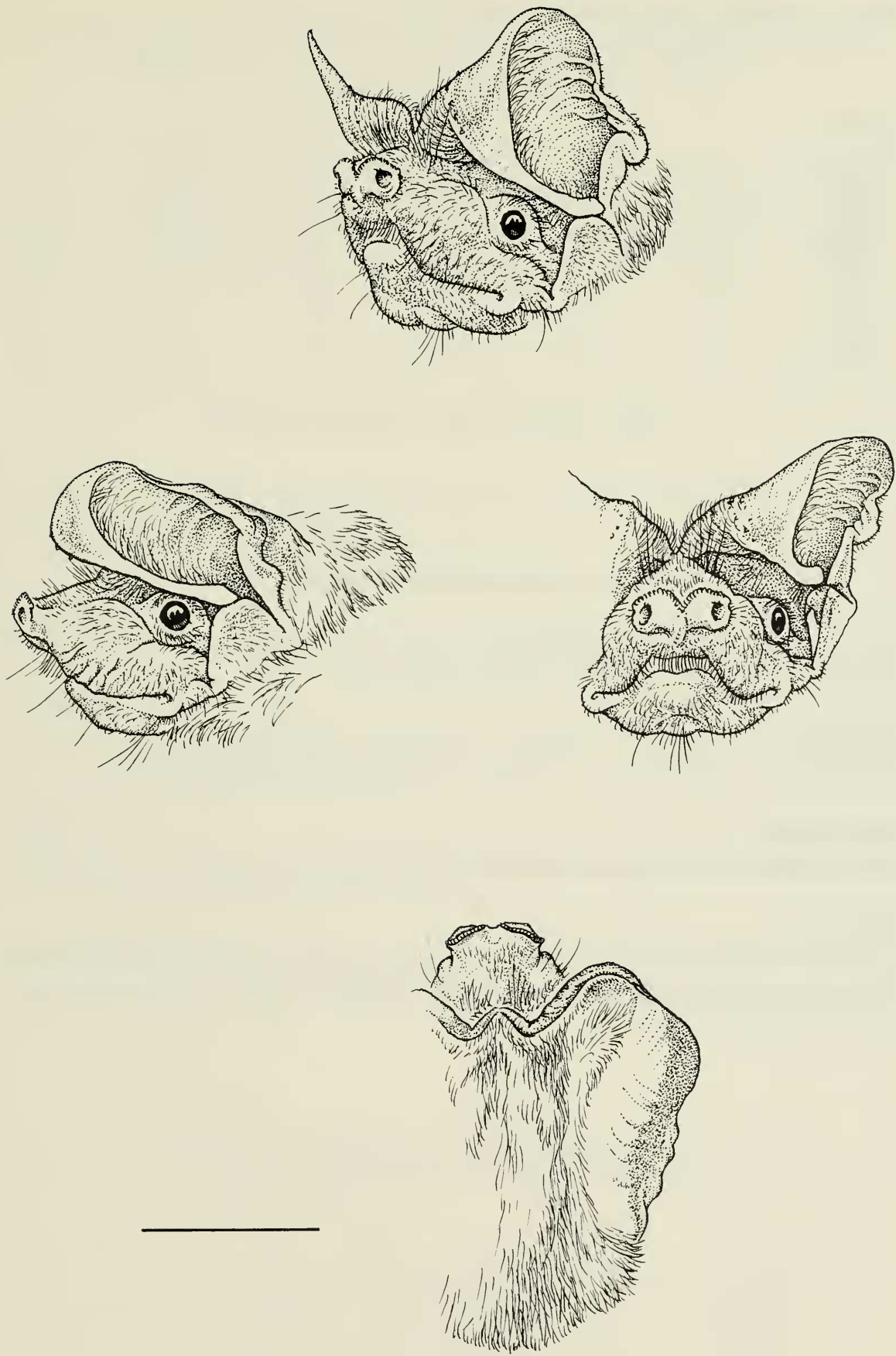


Fig. 18. *Eumops bonariensis beckeri*. Scale bar = 10 mm.

Table 10. Selected sample statistics of *Eumops bonariensis beckeri*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	23	44.20	0.28	50	44.05	0.17
TOLG	10	18.30	0.10	13	17.89	0.17
CBLG	11	17.07	0.10	16	16.54	0.18
ZYGO	12	10.82	0.07	24	10.73	0.07
MAST	13	10.22	0.05	20	10.11	0.08
HBCA	11	6.46	0.06	16	6.42	0.08
C-M ³	12	6.90	0.07	29	6.69	0.05
POCO	13	4.18	0.04	27	4.07	0.04

Eumops bonariensis delticus Thomas, 1923

Eumops delticus Thomas, 1923: 341.

Eumops bonariensis delticus Sanborn, 1932: 355.

Holotype

BMNH 23.8.9.7 adult female; Caldeirão, Marajó Island, Pará, Brazil.

Distribution

Amazon basin of central Brazil and Colombia (Fig. 17).

Diagnosis

Colour Snuff Brown to Blackish Brown dorsally, paler ventrally; basisphenoid pits largest of the species, elongate and shallow. Selected character means given in Table 11.

Table 11. Selected sample statistics of *Eumops bonariensis delticus*

Character	Male		Female		
	n	\bar{X}	n	\bar{X}	\pm S.E.
FOAR	3	45.80	6	46.33	0.40
TOLG	3	18.57	5	18.59	0.12
CBLG	2	17.50	3	17.65	—
ZYGO	3	10.80	6	10.76	0.08
MAST	2	9.90	4	10.10	0.04
HBCA	2	6.60	5	6.40	0.10
C-M ³	3	6.77	6	6.90	0.09
POCO	3	3.80	6	3.80	0.08

Differential Diagnosis

Forearm length similar to that of *E. b. bonariensis* but distinguished from it by a shorter, narrower skull, longer ears, and larger basisphenoid pits.

Specimens Examined

BRAZIL. Bahia: São Marcelo, 11°02'S 45°32'W, 3 (FMNH). Pará: Boim, Rio Tapajós, 2°49'S 55°10'W, 1 (USP); Faro, north bank of Amazon, 2°10'S 56°39'W, 2 (AMNH); Marajó Island, Caldeirão, 0°40'S 49°30'W, 1 (BMNH). COLOMBIA. Caquetá: Tres Esquinas, 0°43'N 75°14'W, 2 (MNHU).

Eumops bonariensis nanus (Miller, 1900)

Promops nanus Miller, 1900: 470 (non *Promops* Gervais, 1855).

Eumops nanus Miller, 1906: 85.

Eumops bonariensis nanus Sanborn, 1932: 356.

Holotype

BMNH 0.7.11.99 adult male; Bugaba (Bogavo), Chiriquí, Panamá.

Distribution

Southern Mexico, Honduras, Panama, northern Colombia, Venezuela, Guyana, and northern Peru (Fig. 17).

Diagnosis

Pelage Bister dorsally, paler ventrally; basisphenoid pits oval and shallow. Selected character means given in Table 12.

Differential Diagnosis

Smallest subspecies of *E. bonariensis*; distinguished by short forearm and skull lengths.

Table 12. Selected sample statistics of *Eumops bonariensis nanus*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	12	39.07	0.50	15	39.66	0.45
TOLG	11	17.02	0.21	14	16.74	0.15
CBLG	11	15.76	0.20	13	15.60	0.17
ZYGO	11	9.96	0.16	14	9.80	0.10
MAST	10	9.26	0.16	13	9.12	0.08
HBCA	11	5.99	0.09	13	5.91	0.07
C-M ³	10	6.27	0.10	13	6.23	0.06
POCO	11	3.70	0.10	13	3.62	0.06

Specimens Examined and Distribution Records

COLOMBIA. Guajira: 119 km N, 32 km W Maracaibo, Venezuela, 12°N 72°W, 2 (USNM). GUYANA. Essequibo: St Ignatius, 3°18'N 59°46'W, 1 (ROM); Kuitaro River, 48 km E Dadanawa, 2°50'N 59°29'W, 1 (ROM); Rau Wau River, 2°50'N 59°00'W, 4 (ROM). HONDURAS. Brus Laguna, Gracias á Dios, 15°40'N 84°20'W, 1 (TCWC). MEXICO. Tabasco: 18 km N, 3 km E Teapa, 17°45'N 92°50'W, 1 (LSU). Veracruz: 4-6 km ENE Tlacotalpan, 18°38'N 95°40'W, 1 (UNAM). Yucatán: 2.5 km NW Dzitya, 21°05'N 89°42'W, 1 (MMNH); Mérida, 20°59'N 89°31'W, 1 (TTU), 2 (MMNH). PANAMA. Chiriquí: Boquerón, 8°31'N 82°34'W, 1 (AMNH); Bugaba (Bogavo), 8°29'N 82°37'W, 1 (BMNH), 1 (USNM). Veraguas: Tolé, 8°16'N 81°40'W, 1 (USNM). PERU. Piura: 6.4 km W Suyo, 4°33'S 80°01'W, 1 (TCWC). VENEZUELA. Apure: La Trinidad de Arauca (Ojasti and Linares, 1971). Falcón: Capatárida, 11°15'N 70°22'W, 3 (USNM).

Eumops dabbenei Thomas, 1914

Eumops dabbenei Thomas, 1914: 481.

Eumops perotis dabbenei Sanborn, 1932: 350.

Holotype

BMNH 14.4.4.8 adult female; Chaco Province, Argentina.

Distribution

Chaco Province, Argentina, Magdalena River valley in Colombia, and northern Venezuela (Fig. 19).

Diagnosis

See drawing of head (Fig. 20). Tragus small and pointed, about 2 mm long; pelage Cinnamon Brown dorsally, Buffy Brown ventrally; basisphenoid pits moderately well developed, oval and shallow; third commissure of M³ rudimentary. See Table 13.

Table 13. Selected character means of *Eumops dabbenei*

Character	Female	
	n	\bar{X}
FOAR	3	77.10
TOLG	3	33.83
CBLG	2	30.82
ZYGO	3	19.47
MAST	3	16.43
HBCA	3	10.87
C-M ³	3	13.00
POCO	3	5.87



Fig. 19. Distribution of *Eumops dabbenei* and *E. underwoodi*. See Systematic Section for list of localities.

Differential Diagnosis

Cabrera (1957) synonymized *E. dabbenei* with *E. p. perotis*. Size and colour similar to that of *E. p. perotis* but distinguished by shorter ears, smaller pointed tragus, heavier, more massive skull; basisphenoid pits shallower and less developed. Ears, tragus, and pelage similar to *E. underwoodi*; differentiated by larger size. *E. dabbenei* is proportionally larger than *E. underwoodi* in wing characters and smaller in skull characters. Nonetheless, a larger sample size is necessary to clarify the status of *E. dabbenei*.

Specimens Examined

ARGENTINA. Chaco: 1 (BMNH). COLOMBIA. Magdalena River, 1 (ANSP). VENEZUELA. Yaracuy: Carabobo, 10 km NW Urama, Río Yaracuy, 10°35'N 68°44'W, 1 (USNM).

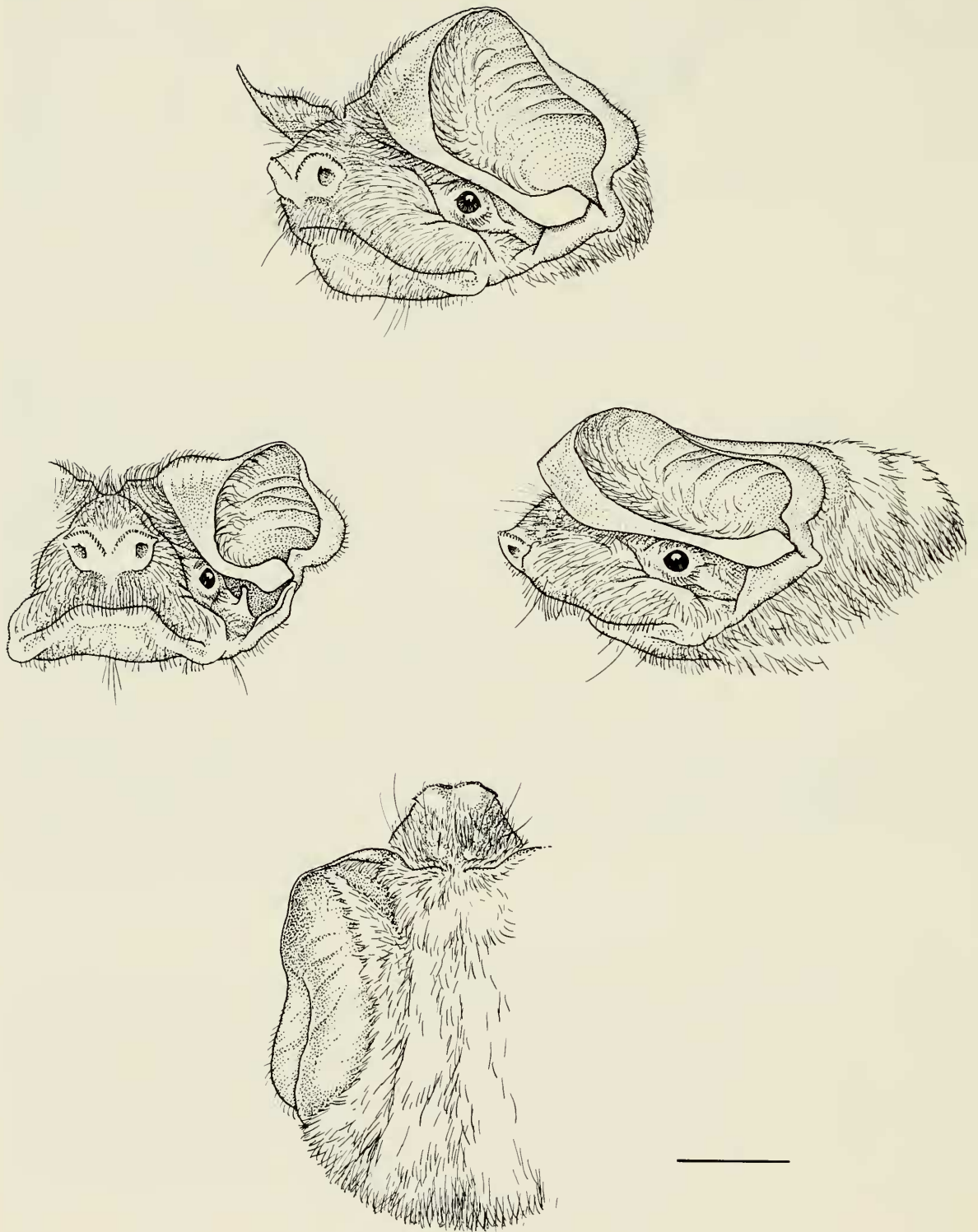


Fig. 20. *Eumops dabbenei*. Scale bar = 10 mm.

Eumops glaucinus (Wagner, 1843)

Dysopes glaucinus Wagner, 1843: 368 (non *Dysopes* Illiger, 1811).

Molossus ferox Gundlach, 1861: 149 (non *Molossus* Geoffroy, 1805).

Molossus glaucinus Dobson, 1876: 714 (non *Molossus* Geoffroy, 1805).

Nyctinomus orthotis H. Allen, 1889: 561 (non *Nyctinomus* Geoffroy, 1818).

Promops glaucinus Miller, 1900: 471 (non *Promops* Gervais, 1855).

Promops orthotis Miller, 1902: 250 (non *Promops* Gervais, 1855).

Eumops orthotis Miller, 1906: 85.

Eumops glaucinus Miller, 1906: 85.

Distribution

Southern Florida, central Mexico, south to Peru, Bolivia, Paraguay, south-eastern Brazil; Cuba and Jamaica (Fig. 21).



Fig. 21. Distribution of *Eumops glaucinus*. See Systematic Section for list of localities.

Diagnosis

Medium-sized species; forearm 56–66; pelage Snuff Brown to Sepia, with white basal band; third commissure of M^3 rudimentary.

Differential Diagnosis

Similar in size to *E. auripendulus* but differs by paler colour of pelage; square broad tragus; larger, better defined basisphenoid pits; skull longer and proportionally wider.

Eumops g. glaucinus (Wagner, 1843)

Eumops g. glaucinus Koopman, 1971: 4.

Holotype

Whereabouts unknown; Cuiaba, Mato Grosso, Brazil.

Distribution

Central Mexico south to Peru, Bolivia, Paraguay, southeastern Brazil; Jamaica and Cuba (Fig. 21).

Diagnosis

See drawing of head (Fig. 22). Tragus square and broad; pelage Snuff Brown to Sepia dorsally, paler ventrally; basisphenoid pits moderately well developed, semi-oval. See Table 14 for means of selected characters.

Differential Diagnosis

Smaller than *E. g. floridanus*; distinguished by shorter forearm and condylobasal lengths.

Specimens Examined and Distribution Records

BOLIVIA. Beni: Itenez, 13°22'S 64°07'W, 2 (USNM). BRAZIL. Mato Grosso: Cuiabá, 15°35'S 56°05'W (Wagner, 1843). Minas Gerais: Sylvestre (nr. Victoria), 22°07'S 45°08'W, 1 (USNM). Pará: Faro, N bank of Amazon River, 2°10'S

Table 14. Selected sample statistics of *Eumops g. glaucinus*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	82	59.62	0.15	153	59.16	0.12
TOLG	68	24.61	0.07	119	24.16	0.05
CBLG	68	23.55	0.07	116	23.13	0.05
ZYGO	67	14.64	0.06	122	14.36	0.04
MAST	65	13.05	0.04	120	12.94	0.03
HBCA	68	8.54	0.04	122	8.45	0.03
C-M ³	72	9.64	0.04	128	9.49	0.02
POCO	69	4.92	0.02	128	4.89	0.01

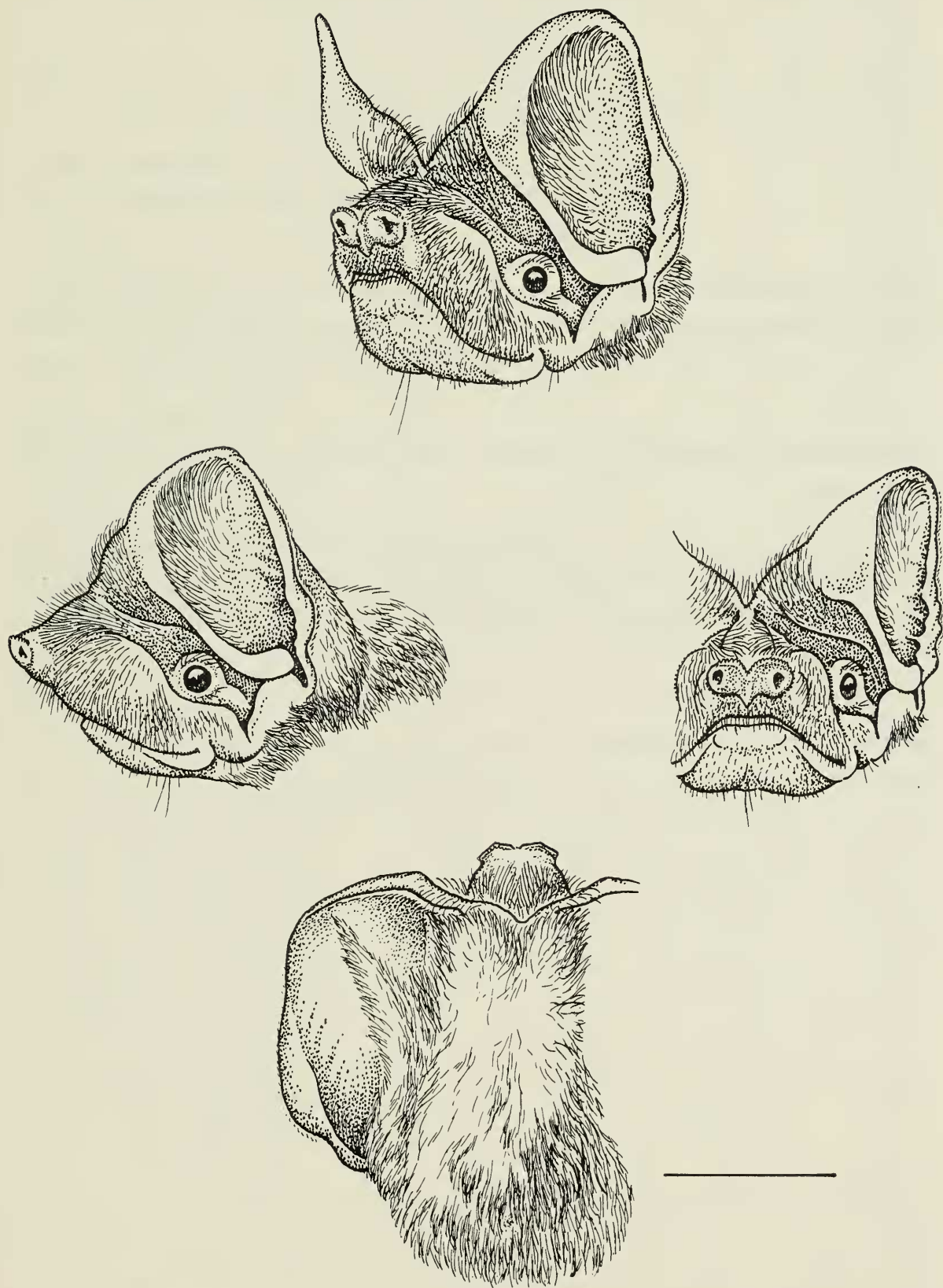


Fig. 22. *Eumops g. glaucinus*. Scale bar = 10 mm.

56°39'W, 4 (AMNH); Rio Tapajós, Piuhy, 2°24'S 54°41'W, 4 (MCZ); Rio Tapajós, Tamari, 3°05'S 55°05'W, 3 (MCV). Rio de Janeiro: Angra dos Reis, 23°S 44°18'W, 1 (USP). BELIZE. Ruinas de Xumantunioh, 1 (UNAM). COLOMBIA. Bolívar: Sincelejo, 9°17'N 75°23'W, 9 (TCWC). Boyacá: El Yopal, 5°21'N 72°23'W, 2 (ROM). Cundinamarca: Bogotá, 4°38'N 74°05'W, 1 (AMNH); Puerto Salgar, 5°28'N 74°39'W, 1 (ROM). Magdalena: Santa Marta, 11°18'N 74°10'W, 4 (AMNH). Meta: Puerto López, 4°05'N 72°58'W, 7 (ROM); Restrepo, 4°15'N 73°33'W, 2 (ROM). Tolima: Espinal, 4°09'N 74°53'W, 1 (FMNH); Honda, 5°15'N 74°50'W, 5 (AMNH). COSTA RICA. Alajuela: Cariblanca, 29 km NE Naranjo, 9°56'N 84°57'W, 4 (TCWC). Cartago: Finca la Margot, Turrialba, 9°56'N 83°40'W, 1 (TCWC). San José: 2 km NW Santa Ana (Finca Lornessa), 9°55'N 84°10'W, 19 (LSU). CUBA. No locality: 1 (AMNH), 4 (USNM); Cobre, 23°09'N 82°10'W, 1 (AMNH); Guatánamo, 20°09'N 75°14'W, 20 (USNM), 3 (AMNH); Habana, 23°07'N 82°05'W, 1 (USNM); Los Palacios River, 22°35'N 83°16'W, 3 (YPM), 1 (AMNH); Madruga, 22°55'N 81°51'W, 1 (MCZ); Pinar del Río, 22°24'N 83°42'W, 1 (USNM). ECUADOR. Guayas: Guayquil, 2°13'S 79°54'W, 1 (USNM), 1 (AMNH). GUYANA. Essequibo, Rupununi: Achamere Wau, 2°45'N 59°20'W, 6 (ROM); Aroquoi Tributary, Rupununi R., 3°N 59°30'W, 8 (ROM) Rewa River, 3°15'N 58°30'W, 2 (ROM). HONDURAS. Comayagua: 1 km W Comayagua, 14°30'N 87°39'W, 4 (TCWC); La Paz, 14°20'N 87°40'W, 2 (AMNH). Cisco Morzan: 16 km N Tegucigalpa, 14°20'N 87°10'W, 1 (TTU). JAMAICA. Kingston: 17°58'N 76°48'W, 2 (IJ); Spanish Town, 17°59'N 76°58'W, 2 (USNM); St. Andrew, 1 (USNM), 1 (MCZ). St. Ann Parish: Queenhythe, 18°20'N 77°25'W, 5 (TTU). MEXICO. Morelos, 1 (USNM). Chiapas: Palenque, 17°32'N 91°59'W, 1 (FMNH); 19 km E Ortiz Rubio on Villa Flores Road, 16°15'N 93°12'W, 2 (UA); Rancho San Fernando, 42 km W Cintalapa, 16°42'N 94°05'W, 4 (UA); 10 km SE Tonalá, 16°08'N 93°41'W, 2 (LACM), 3 (UA); 4.8 km E Cintalapa, 16°42'N 96°45'W, 1 (TCWC). Colima: La Gloria, 29 km W Pueblo Juárez, 19°10'N 104°12'W, 1 (UNAM), 1 (UA); La Jala, 2 (UA); Las Juntas, 5 km SE Pueblo Juárez, 3 (UA), 2 (TTU); Las Juntas, 26 km W Pueblo Juárez, 4 (UNAM); Río Armería, 8 km N Tecomán, 19°00'N 103°50'W, 1 (LSU); Pueblo Juárez, 2 (UA); La Sidra near Agua Zarca, 19°12'N 103°55'W, 1 (LACM). Vera Cruz: Jesús Carranza, 17°28'N 95°01'W, 3 (KU); 36 km W Puente Nacional, 19°20'N 96°50'W, 3 (TTU). Yucatán: Hacienda Calcehtok, 20°34'N 89°55'W, 1 (UNAM); 6 km S, 5 km W Kinchilil, 20°50'N 89°59'W, (Birney *et al.*, 1974); Mérida, 20°59'N 89°31'W (Birney *et al.*, 1974). NICARAGUA. 1.5 km SE Yalaguina, 13°20'N 86°30'W, 1 (TCWC). PANAMA. Chiriquí: Progreso, 8°29'N 82°50'W, 2 (USNM). PARAGUAY. Presidente Hayes: 275 km NW Villa Hayes by road, 23°10'S 58°30'W, 5 (MVZ). PERU. Piura: 6 km W Suyu, 4°33'S 80°01'W, 14 (TCWC). VENEZUELA. Amazonas: Río Manapiare, San Juan, 5°10'N 66°12'W, 37 (USNM). Bolívar: 2 km NE Maripa, 7°26'N 65°09'W, 1 (KU). Carabobo: Montalbán, 10°13'N 68°20'W, 4 (USNM). Distrito Federal: Caracas, 10°35'N 66°56'W, 1 (USNM); Chichiriviche, 10°33'N 67°14'W, 1 (UCV). Lara: Río Tocuyo, 10°18'N 70°00'W, 4 (AMNH). Sucre: Cumaná, 10°29'N 64°12'W, 1 (KU). Yaracuy: 8 km N, 18 km W San Felipe, near Aroa, 10°26'N 68°54'W, 7 (USNM). Zulia: 1 (USNM).

Eumops glaucinus floridanus (Allen, 1932)

Molossides floridanus Allen, 1932: 257.

Eumops floridanus Ray et al., 1963: 377.

Eumops glaucinus floridanus Koopman, 1971: 4.

Holotype

MCZ 17672; stratum 2, Melbourne bed, Melbourne, Brevard Co., Florida.

Current Distribution

Miami area, Florida (Fig. 21).

Diagnosis

Tragus square and broad; basisphenoid pits moderately well developed, shallow and oval; third commissure of M³ is one-fourth the length of the second commissure. See Table 15 for means of selected characters.

Differential Diagnosis

Similar to *E. g. glaucinus* but larger; separable by forearm and condylobasal lengths.

Specimens Examined and Distribution Records

UNITED STATES. Florida: Brevard Co., Melbourne, 28°04'N 80°38'W (Allen, 1932); Dade Co., Miami, 25°47'N 80°07'W, 9 (AMNH), 5 (FMNH), 12 (UM).

Table 15. Selected sample statistics of *Eumops glaucinus floridanus*

Character	Male		
	n	\bar{X}	\pm S.E.
FOAR	20	64.27	0.28
TOLG	12	26.85	0.12
CBLG	12	25.52	0.11
ZYGO	12	16.40	0.10
MAST	12	14.13	0.05
HBCA	12	9.06	0.09
C-M ³	12	10.55	0.06
POCO	12	5.23	0.04

Eumops hansae Sanborn, 1932

Eumops hansae Sanborn, 1932: 356.

Eumops amazonicus Handley, 1955: 177.

Eumops hansae Gardner *et al.*, 1970: 726.

Holotype

USNM 200993 adult male; Colonia Hansa, near Joinville, Santa Catarina, Brazil.

Distribution

Brazil, Guyana, Venezuela, Costa Rica, and Panama (Fig. 23).

Diagnosis

See drawing (Fig. 24). Tragus broad and square; pelage rich Blackish Brown dorsally, paler ventrally; ventral hair tricoloured; basisphenoid pits well developed, sharply defined, deep; third commissure of M^3 well developed, as long as the second. Sexual dimorphism pronounced. See Table 16.



Fig. 23. Distribution of *Eumops hansae*. See Systematic Section for list of localities.

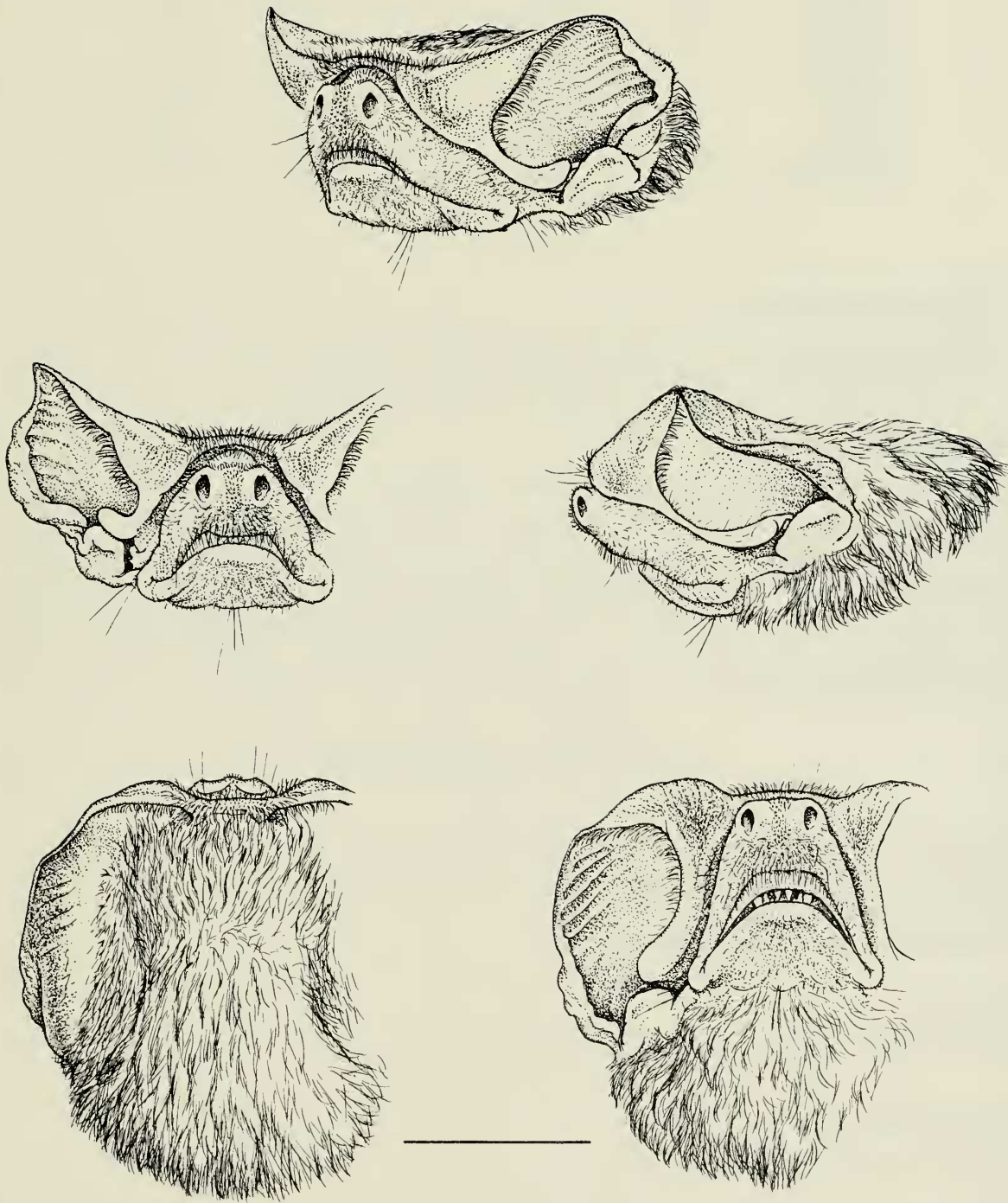


Fig. 24. *Eumops hansae*. Scale bar = 10 mm.

Table 16. Selected sample statistics of *Eumops hansae*

Character	Male		Female		
	n	\bar{X}	n	\bar{X}	\pm S.E.
FOAR	3	41.23	5	37.80	0.34
TOLG	3	20.87	4	18.86	0.20
CBLG	3	19.77	4	17.90	0.12
ZYGO	3	12.13	3	10.83	—
MAST	3	10.68	4	9.90	0.09
HBCA	3	7.00	4	6.05	0.06
C-M ³	3	7.60	4	6.89	0.08
POCO	3	4.20	4	4.00	0.04

Differential Diagnosis

Similar in size to *E. bonariensis*, but skull is proportionally longer; basisphenoid pits longer and deeper; pelage colour much darker.

Specimens Examined

BRAZIL. Amazonas: Manaus, 3°08'S 60°00'W, 1 (USNM). Santa Catarina: Colonia Hansa, near Joinville (Corupa), 26°26'S 49°14'W, 1 (USNM). COSTA RICA. Puntarenas, 16 km S Palmar Sur, 10°N 84°50'W, 1 (LSU). GUYANA. Essequibo: Ishi Wau, Maruranau, 2°45'N 59°10'W, 1 (ROM). Demerara: Arampa, 5 km S Ituni, 5°28'N 58°15'W, 2 (ROM). PANAMA. Darién: Tacarcuna Village, 8°05'N 77°17'W, 1 (USNM). VENEZUELA. Bolívar: 59 km SE El Dorado, 6°20'N 61°30'W, 1 (USNM).

Eumops maurus (Thomas, 1901)

Molossus maurus Thomas, 1901: 141 (non *Molossus* Geoffroy, 1805).

Myopterus maurus Trouessart, 1904: 101 (non *Myopterus* Oken, 1816).

Eumops maurus Miller, 1906: 85.

Eumops geijskesi Husson, 1962: 246.

Holotype

BMNH 1.6.4.34 adult male; Kanuku Mountains, Guyana.

Distribution

Guyana and Surinam (Fig. 25).

Diagnosis

Pelage dark Chocolate Brown dorsally and ventrally; narrow band of white hair (5 mm) along the ventro-lateral sides of the body and the proximal part of the mesopatagium between the humerus and femur; basisphenoid pits oval, shallow, moderately well developed; small anterior upper premolar is absent in holotype but present in specimens from Surinam. See Table 17 for selected character means.

Table 17. Selected character means of *Eumops maurus*

Character	Male		Female	
	n	\bar{X}	n	\bar{X}
FOAR	1	53.00	2	51.90
TOLG	1	21.70	2	20.70
CBLG	1	20.10	2	19.10
ZYGO	1	12.35	2	12.35
MAST	1	10.50	2	10.82
HBCA	1	7.70	1	7.20
C-M ³	1	8.20	2	8.27
POCO	1	3.95	2	4.12



Fig. 25. Distribution of *Eumops maurus*. See Systematic Section for list of localities.

Differential Diagnosis

Resembles *E. a. auripendulus* in pelage colour and shape of skull but is smaller, with a unique ventro-lateral band of white fur.

Remarks

A specimen reported as *E. maurus* (Villa R., 1956) was subsequently identified as *E. auripendulus oaxacensis* by Jones *et al.* (1973).

Specimens Examined

GUYANA. Essequibo: Kanuku Mountains, 1 (BMNH). SURINAM. No locality, 2 (RMNH).

Eumops perotis (Schinz, 1821)

Molossus perotis Schinz, 1821: 870 (non *Molossus* Geoffroy, 1805).

Dysopes perotis Wied, 1827: 227 (non *Dysopes* Illiger, 1811).

Dysopes (Molossus) gigas Peters, 1864: 381.

Promops perotis Thomas, 1901: 191 (non *Promops* Gervais, 1855).

Eumops perotis Miller, 1906: 85.

Distribution

Southern regions of California, Arizona, New Mexico, and Texas; northern Mexico, Venezuela, Ecuador, Peru, Paraguay, Bolivia, northern Argentina, and southern Brazil (Fig. 26).

Diagnosis

Size large; forearm 75–83; colour Olive-Brown; tragus broad and square; third commissure of M^3 is one-fourth the length of the second; basisphenoid pits are elongate, deep.

Differential Diagnosis

See account for *E. dabbenei* (page 37).

Eumops perotis perotis (Schinz, 1821)

Eumops p. perotis Sanborn, 1932: 349.

Eumops perotis renatae Pirlot, 1965: 5.

Holotype

AMNH 435; Villa São Salvador, Campos dos Goitacazes, Rio Paraíba, Rio de Janeiro, Brazil.

Distribution

Northern Venezuela, Paraguay, northern Argentina, southern Brazil, Bolivia, and east of the Andes in Ecuador and Peru (Fig. 26).



Fig. 26. Distribution of *Eumops perotis* and *E. trumbulli*. See Systematic Section for list of localities.

Diagnosis

See drawing (Fig. 27). Tragus square and broad; pelage Olive-Brown; paler basal band; basisphenoid pits well developed, elongate, deep. See Table 18 for selected character means.

Differential Diagnosis

Similar to *E. perotis californicus* but differs by larger body, forearm, and skull; relatively wider rostrum.

Specimens Examined and Distribution Records

ARGENTINA. Chaco: General Vedia, 26°56'S 58°40'W, 3 (ROM), 1 (TCWC). Jujuy: Libertador General San Martín, 23°50'S 64°45'W, 1 (ROM); San Salvador de Jujuy, 24°10'S 65°48'W, 1 (UNAM); Yuto, 23°38'S 64°28'W, 1 (AMNH). Salta: Dragones, 23°15'S 63°15'W, 2 (ROM), 1 (UNAM); Salta, 24°46'S 65°28'W, 1 (ROM); 30 km NE Salta, 24°30'S 65°05'W, 1 (UNAM); Campo Santo, 24°36'S 65°09'W, 8 (ROM), 3 (TCWC). Santiago del Estero: Nueva Esperanza, 26°10'S

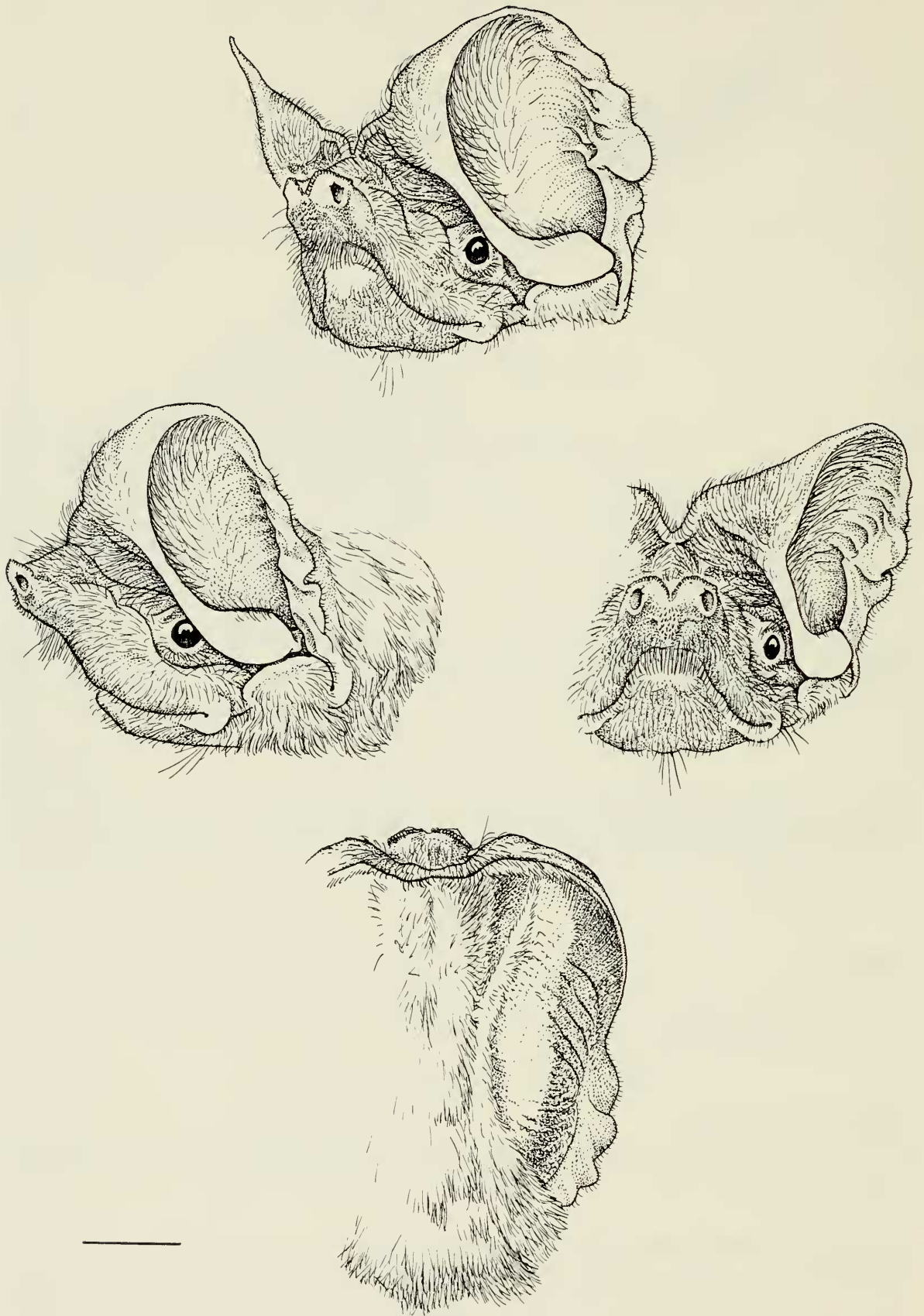


Fig. 27. *Eumops p. perotis*. Scale bar = 10 mm.

Table 18. Selected sample statistics of *Eumops p. perotis*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	21	80.22	0.49	33	78.56	0.35
TOLG	13	33.67	0.17	27	32.52	0.11
CBLG	13	32.12	0.17	27	31.03	0.11
ZYGO	15	19.04	0.13	29	18.41	0.08
MAST	12	15.75	0.12	25	15.40	0.07
HBCA	13	10.20	0.11	28	9.80	0.07
C-M ³	16	13.14	0.11	29	12.81	0.05
POCO	15	5.49	0.05	28	5.35	0.04

64°20'W, 3(ROM). Tucumán: Concepción, 27°20'S 65°35'W, 1 (FMNH); Tucumán, 26°47'S 65°15'W, 2 (BMNH). BOLIVIA. No locality, 1 (BMNH). BRAZIL. Goiás: Parano do Manhã, 12°43'S 46°25'W, 1 (IRSNB). Maranhão: Barra do Corda, 5°30'S 45°05'W, 5 (FMNH). Minas Gerais: Mariana, 20°23'S 43°25'W, 1 (USP); Lagoa Santa, 19°39'S 43°44'W, 1 (USNM), 5 (FMNH); Rio Velhas, 17–20°S 44°W, 13 (MCZ). Piauí: Sete Lagoas, 8°27'S 41°42'W, 1 (BMNH). Rio de Janeiro: Universidade Rural (km 47), 22°51'S 43°47'W, 1 (UNAM); Rio de Janeiro, 22°53'S 43°17'W, 1 (MCZ); Villa São Salvador, Campos dos Goitacazes, 21°49'S 41°16'W (Schinz, 1821). ECUADOR. Guayas: Guayaquil, 2°12'S 79°53'W, 2 (MNH). PARAGUAY. Chaco: Filadelfia, 22°17'S 60°03'W, 1 (FMNH). Central: Asunción, 25°15'S 57°40'W, 1 (FMNH). PERU. Huancavelica: Cordóva, 14°01'S 75°10'W, 1 (BMNH). Lima: Lima, 12°06'S 77°03'W (de la Puente, 1951). VENEZUELA. Anzoátegui: Cantaura, 9°19'N 64°21'W, 1 (USNM). Arauca: San Sebastián, 9°56'N 67°15'W (Linares, 1968). Sucre: Cumaná, 10°29'N 64°12'W, 1 (KU).

Eumops perotis californicus (Merriam, 1890)

Molossus californicus Merriam, 1890: 31 (non *Molossus* Geoffroy, 1805).
Promops perotis californicus H. Allen, 1893: 175 (non *Promops* Gervais, 1855).
Promops californicus Miller and Rehn, 1902: 271.
Eumops californicus Miller, 1906: 85.
Eumops perotis californicus Sanborn, 1932: 351.

Holotype

USNM 186448 adult female; Alhambra, Los Angeles County, California.

Distribution

Southern regions of California, Arizona, New Mexico, and Texas; and Northern Mexico (Fig. 26).

Table 19. Selected sample statistics of *Eumops perotis californicus*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	40	76.11	0.29	102	75.12	0.16
TOLG	28	32.29	0.10	66	31.40	0.05
CBLG	27	31.31	0.11	66	30.37	0.06
ZYGO	29	18.00	0.08	72	17.58	0.04
MAST	28	15.44	0.06	62	15.12	0.03
HBCA	26	9.03	0.04	66	8.98	0.03
C-M ³	33	12.41	0.05	81	12.23	0.03
POCO	33	5.04	0.03	73	5.00	0.02

Description

Tragus square and broad; pelage Olive-Brown. See Table 19 for selected character means.

Differential Diagnosis

See account for *E. p. perotis* (p. 49).

Specimens Examined and Distribution Records

MEXICO. Coahuila: nr. Cuatro Ciéneas (Gilmore, 1947); Acatita, 26°26'N 102°59'W, 1 (UNAM). Sinaloa: 1665 km marker, Mexico Hwy. 15, few miles S of Sonoran Border, 1 (TTU). Sonora: Pilaes, 30°36'N 109°25'W, 7 (UMMZ); Río Alamos, approx. 29°N 110°W, 1 (TTU). Zacatecas: Santa Rosa, 23°12'N 103°10'W (Matson and Patten, 1975). UNITED STATES. Arizona: Greenlee Co., 0.15 km (0.25 mi) N Pumo Station, Eagle Creek, 1 (UA); Maricopa Co., Scottsdale, 33°25'N 111°55'W, 1 (UA), 2 (USNM); Mohave Co., Secret Pass, near Kingman, 35°12'N 114°02'W, 2 (UI), 8 (UA); Pima Co., Santa Catalina Mts., Sabino, 32°23'N 110°50'W, 4 (UA); Tucson area, 32°15'N 110°57'W, 3 (UA), 1 (USNM); Pinal Co., Casa Grande Rim, Coolidge, 32°52'N 111°46'W, 1 (UA); Yuma Co., Parker, 34°09'N 114°18'W, 1 (USNM); Yuma, 32°40'N 114°39'W, 1 (USNM). California: No locality, 1 (USNM); Colorado Desert, Dos Cabasas, 33°N 115–116°W, 1 (USNM); Alameda Co., Hayward, 37°40'N 122°07'W, 1 (USNM); Butte Co., Oroville, 39°31'N 121°34'W, "A. Beck, personal communication, 1973"; Fresno Co., Fresno, 30°41'N 119°47'W, 1 (MVZ); Trimmer, 1 (MVZ); Imperial Co., 38.6 km (24 mi) S Palo Verde, 33°13'N 114°44'W, 1 (MVZ); Kern Co., 1.6 km (1 mi) SW Democrat Springs, Kern River, 8 (MVZ); 16 km (10 mi) NW Taft, 35°08'N 119°28'W, 1 (ROM), 1 (LSU); Los Angeles Co., Alhambra, 34°05'N 118°08'W, 2 (USNM), 1 (AMNH), 1 (UI); Azusa, 34°08'N 117°51'W, 4 (USNM), 1 (MCZ), 1 (AMNH), 2 (LSU); Covina, 34°05'N 117°52'W, 4 (FMNH), 12 (USNM), 4 (UI), 2 (MVZ), 1 (AMNH); Los Angeles, 34°00'N 118°15'W, 1 (AMNH), 16 (USNM), 1 (LSU); Pasadena, 34°10'N 118°09'W, 4 (MVZ); Pomona, 34°04'N 117°45'W, 7 (UMMZ), 1 (KU); Sierra Madre, 6 (MVZ); Monterey Co., Camphora, 3.2 km (2 mi) N Soledad, 36°25'N 121°20'W, 1 (MVZ); Orange Co., Santa Ana, 33°44'N 117°54'W, 1 (ROM); Riverside Co., 6.4 km (4 mi) SW Lakeview, 33°59'N 117°22'W, 2 (KU); San Benito Co., Silver

Creek, 12 km (7.5 mi) ESE Panoche, 36°36'N 120°50'W, 9 (MVZ); San Bernardino Co., Colton, 34°05'N 117°20'W, 1 (UI), 1 (KU); San Diego Co., 2.4 km (1.5 mi) N Barrett Junction, 32°37'N 116°42'W, 3 (MVZ), 1 (KU); San Diego, nr Dulzura, 32°39'N 116°46'W, 4 (FMNH); Mariposa, 37°30'N 119°58'W, 1 (ANSP). New Mexico: Hidalgo Co., 51 km (32 mi) S, 0.8 km (0.5 mi) E Rodeo, 31°30'N 109°02'W (Rowlett, 1972). Texas: Brewster Co., Chilicotal Mts., Big Bend National Park, 2 (TCWC); Black Gap Wildlife Refuge, 29°30'N 102°50'W, 3 (DMNH); Presidio Co., 3.2 km (2 mi) NE Candelaria, 30°15'N 104°42'W, 12 (TCWC), 12 (ROM); Valverde Co., Langtry, 29°49'N 101°36'W, 1 (USNM).

Eumops trumbulli (Thomas, 1901)

Promops trumbulli Thomas, 1901: 190 (non *Promops* Gervis, 1855).

Eumops trumbulli Miller, 1906: 85.

Eumops perotis trumbulli Sanborn, 1932: 350.

Eumops trumbulli Sanborn, 1949: 283.

Holotype

BMNH 99.11.2.1 immature male; Pará, Brazil.

Distribution

Guyana, southern Venezuela; Amazon basin of Brazil, Colombia, Bolivia, and Peru (Fig. 26).

Diagnosis

Pelage Olive-Brown to Buffy Brown; tragus broad, and square; basisphenoid pits well developed, elongate, deep; third commissure of M³ half the length of the second. See Table 20 for character means.

Differential Diagnosis

Similar to *E. p. perotis* but smaller, third commissure of M³ longer than in *E. p. perotis*.

Table 20. Selected sample statistics of *Eumops trumbulli*

Character	Male			Female		
	n	\bar{X}	± S.E.	n	\bar{X}	± S.E.
FOAR	20	71.55	0.41	31	70.22	0.26
TOLG	18	29.19	0.20	21	28.31	0.15
CBLG	17	27.89	0.19	18	26.86	0.17
ZYGO	18	16.67	0.16	20	16.18	0.07
MAST	14	14.32	0.09	16	13.92	0.09
HBCA	16	8.67	0.07	18	8.53	0.06
C-M ³	22	11.35	0.06	26	11.09	0.06
POCO	19	4.92	0.05	25	4.86	0.04

Remarks

Since the review of Sanborn (1932), the status of *E. trumbulli* has been questionable. Sanborn (1949) and Smith and Genoways (1969) considered *E. trumbulli* to be a distinct species, whereas Koopman (1971) inferred that it should be considered a race of *E. perotis*. The geographic range of these taxa are allopatric, but multivariate analyses indicate that greater differences exist between *E. perotis* and *E. trumbulli* than between *E. auripendulus* and *E. underwoodi*.

Specimens Examined and Distribution Records

BOLIVIA. Beni: Guayaramerín, 10°51'S 65°23'W, 4 (AMNH). BRAZIL. Amazonas: Rio Juruá, 3°27'S 66°03'W, 1 (USP); Manacapuru, 3°18'S 60°37'W, 1 (BMNH); Manaus, 3°08'S 60°01'W, 1 (IRSNB); mouth of Lake Tefé, 3°27'S 64°47'W, 2 (AMNH). Pará: Belém, 1°27'S 48°29'W, 1 (BMNH); Cametá, Rio Tocantins, 2°15'S 49°30'W, 3 (MCZ); Ilha do Taiuna, Rio Tocantins, 1 (AMNH); Marajó, Caldeirão, 0°45'S 56°13'W, 4 (BMNH); Mocajuba, Rio Tocantins, 2°36'S 49°29'W, 8 (AMNH); Vilarinho do Monte, Rio Xingu, 1°37'S 52°01'W, 2 (AMNH). COLOMBIA. Amazonas: Leticia, 4°09'S 69°57'W, 7 (ROM); Puerto Nariño, 50 km NW Leticia, 4°56'N 67°48'W, 2 (USNM). Meta: Puerto López, 4°05'N 72°58'W, 9 (ROM), 4 (USNM). GUYANA. Essequibo, Rupununi: Tamtoon House, 2°20'N 59°40'W, 1 (ROM); Quash Wau, 16 km N Dadanawa, 2°55'N 59°30'W, 2 (ROM); Rewa River, 3°20'N 58°40'W, 1 (ROM); Droop Wau, 2°45'N 59°30'W, 1 (ROM); Sand Creek Indian Reservation, 3°00'N 59°35'W, 1 (ROM). PERU. Loreto: Alto Río Tamaya, 8°59'S 73°19'W, 1 (FMNH); Iquitos, 3°51'S 73°13'W, 2 (UNAM); Yarinacocha, Río Ucayali (Sanborn, 1949), 4 (FMNH). SURINAM. Surinam: Zanderij, 5°26'N 55°14'W, 1 (RMNH). VENEZUELA. Bolívar: Maripa, 7°22'N 65°09'W, 4 (KU).

Eumops underwoodi Goodwin, 1940

Eumops underwoodi Goodwin, 1940: 2.

Distribution

Southern Arizona south to Honduras (Fig. 19).

Diagnosis

Size large; ears small; tragus small, rounded; skull heavy, robust; basisphenoid pits moderately well developed, oval, shallow; third commissure of M³ rudimentary; pelage Cinnamon Brown to Mummy Brown dorsally, paler ventrally.

Differential Diagnosis

Distinct species with skull shorter and more robust and basisphenoid pits about one-half the size of those of *E. perotis*.

Eumops underwoodi underwoodi Goodwin, 1940

Eumops u. underwoodi Hall and Villa, 1949: 446.

Holotype

AMNH 126862 adult male; El Pedrero, 6 km north of Chinaela, La Paz, Honduras.

Distribution

Honduras, Belize, north to Chihuahua, Mexico (Fig. 19).

Diagnosis

See drawing (Fig. 28). Pelage Cinnamon Brown to Mummy Brown. See Table 21 for selected character means.

Differential Diagnosis

Similar to *E. u. sonoriensis*, but body size, forearm, and skull are larger.

Specimens Examined and Distribution Records

BELIZE. Corozal: 4.8 km W Corozal, 18°23'N 88°23'W, 3 (LSU). HONDURAS. La Paz: El Pedrero, 6 km N Chinaela, 14°20'N 87°40'W, 4 (AMNH). MEXICO. Chiapas: 19.2 km E Ortiz Rubio on Villa Flores Rd., 16°15'N 93°12'W, 3 (UA); 10 km SE Tonalá, 16°08'N 93°41'W, 1 (UNAM); Rancho San Fernando, 42 km W Cintalapa, 1 km W San Miguel, 16°10'N 92°43'W, 5 (UA); 5–8 km N Arriaga, 16°15'N 93°52'W, 2 (TCWC). Chihuahua: Naranjo, 27°15'N 107°55'W, 1 (LACM). Colima: Las Juntas, 26 km W Pueblo Juárez, 19°10'N 104°14'W, 1 (UNAM), 1 (UA); Río Armería, 8 km N Tecomán, 19°00'N 105°50'W, 1 (LSU). Jalisco: Juntas del Salitre, 6 km N Soyatlán del Oro, 20°30'N 103°40'W, 2 (UA); 9 km NW Cuautla, 20°10'N 104°20'W, 1 (KU); 3 km NE Talpa, 20°22'N 104°50'W, 8 (KU). Michoacán: Tancitarío Mt., Rancho Escondido, 3.2 km N Apo, 19°26'N 102°18'W, 2 (UMMZ). Morelos: Palo Bolero, 18°44'N 99°13'W, 1 (UNAM). Oaxaca: 4.8 km S Nejapa, 16°37'N 95°57'W, 1 (KU); Río Jalatengo, km 178 on Puerto Angel Rd., 15°50'N 96°35'W (Arnold and Schonewald, 1972). Tabasco: 20 km N Balancán, 17°50'N 91°35'W, 4 (LSU).

Table 21. Selected sample statistics of *Eumops u. underwoodi*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	8	71.72	0.53	32	71.25	0.26
TOLG	7	31.13	0.40	23	30.22	0.11
CBLG	7	29.41	0.25	22	28.54	0.09
ZYGO	6	18.47	0.29	23	17.98	0.07
MAST	6	16.22	0.20	22	15.78	0.06
HBCA	7	10.04	0.32	21	9.95	0.08
C-M ³	7	12.11	0.09	24	11.76	0.06
POCO	7	5.86	0.09	24	5.67	0.03

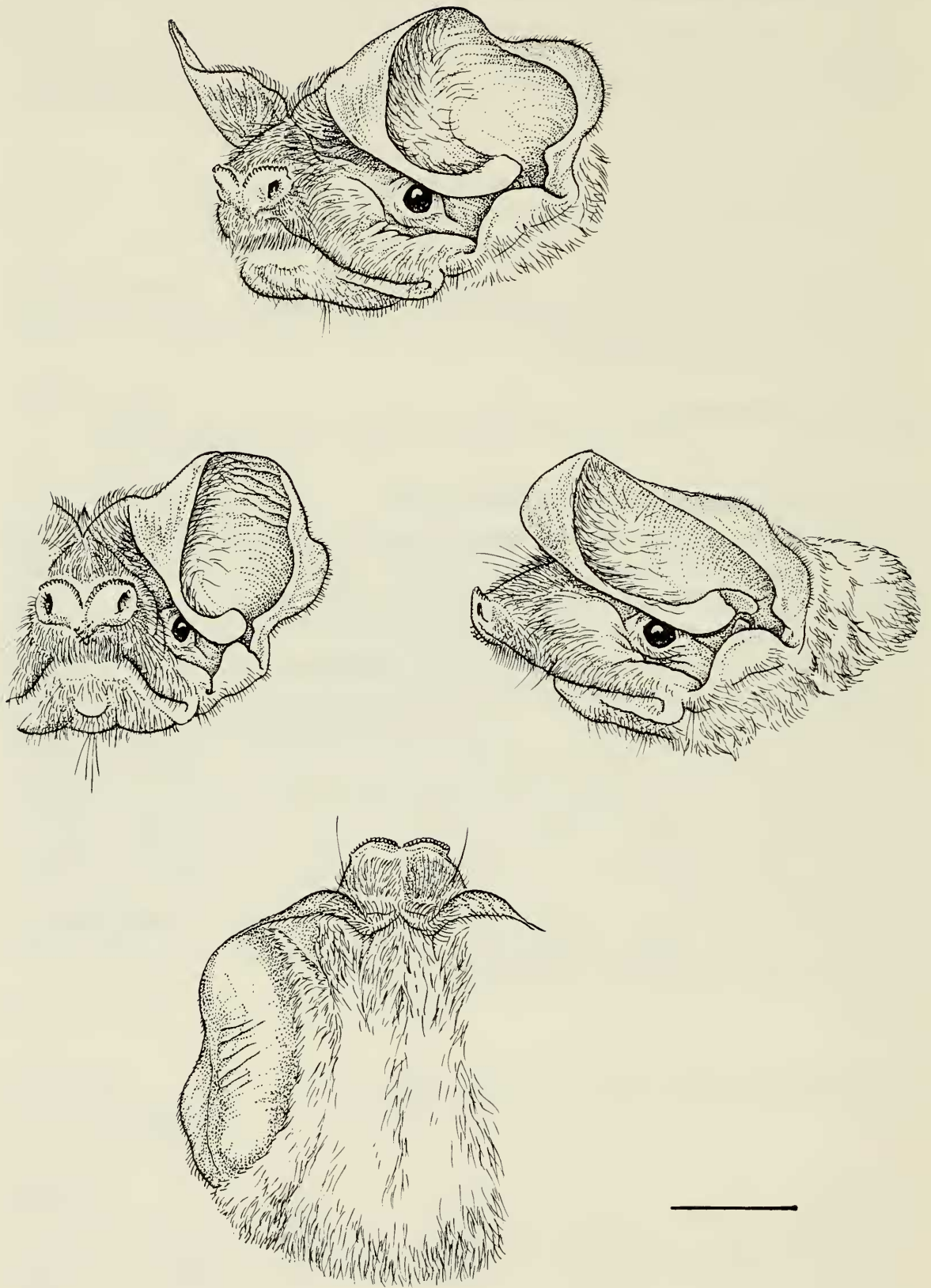


Fig. 28. *Eumops u. underwoodi*. Scale bar = 10 mm.

Eumops underwoodi sonoriensis Benson, 1947

Eumops sonoriensis Benson, 1947: 133.

Eumops underwoodi sonoriensis Hall and Villa R., 1949: 446.

Holotype

MVZ 82150 adult male; Rancho de Costa Rica, Rio Sonora, Sonora, Mexico.

Distribution

Southern Arizona; state of Sonora, Mexico (Fig. 19).

Diagnosis

Pelage Sayal Brown to Bister dorsally, paler ventrally. See Table 22 for character means.

Differential Diagnosis

Similar to *E. u. underwoodi*, but body, forearm, and skull lengths smaller.

Specimens Examined and Distribution Records

MEXICO. Sonora: 32 km N Guymas, 27°59'N 110°54'W, 1 (UA); 2 km SW Matorrena, 28°05'N 110°45'W, 6 (LACM); 16 km NW Noche Buena, approx. 28°N 111°W, 4 (MVZ); Rancho de Costa Rica, Río Sonora, 1 (UNAM), 6 (MVZ); 1 km SE 1A, Colorado, 28°05'N 110°45'W, 1 (TTU); 1 km W San José de Guaymas, 27°44'N 110°46'W, 1 (TTU). UNITED STATES. Arizona: Maricopa Co., Deer Valley School, 6.4 km (4 mi) N Sun City on Lake Pleasant Road, 33°43'N 112°30'W, 1 (MSB); Pima Co., Garcia Represso, 3.2 km (2 mi) E Sasabe, 31°31'N 111°31'W, 7 (UA), 2 (USNM), 1 (KU), 1 (LSU); Papago Reservation, 1.6 km (1 mi) N Mexican Boundary # 143, 1 (UA); 1.6 km (1 mi) N, 18.4 km (11.5 mi) E Topawa, 31°50'N 111°48'W, 2 (UI).

Table 22. Selected sample statistics of *Eumops underwoodi sonoriensis*

Character	Male			Female		
	n	\bar{X}	\pm S.E.	n	\bar{X}	\pm S.E.
FOAR	17	68.61	0.48	11	67.51	0.59
TOLG	20	28.92	0.12	12	28.37	0.16
CBLG	20	27.70	0.10	12	27.11	0.17
ZYGO	20	17.39	0.08	12	16.92	0.11
MAST	20	15.20	0.06	12	14.92	0.11
HBCA	20	9.26	0.09	12	9.11	0.15
C-M ³	20	11.51	0.05	12	11.42	0.09
POCO	20	5.50	0.04	12	5.42	0.04

Nomenclatural Recommendations

The classification presented here summarizes the phenetic relationships for *Eumops* as determined by the preceding analyses: *E. auripendulus*, consisting of two allopatric taxa; *E. bonariensis*; *E. dabbenei*, a monotypic species allied with *E. glaucinus*, *E. underwoodi*, and *E. auripendulus*, not a subspecies of *E. perotis*; *E. glaucinus*, with two allopatric subspecies; *E. hansae*; *E. maurus*; *E. perotis*, with two allopatric subspecies; and *E. trumbulli*. In the past the specific status of *E. trumbulli* has been questioned. Sanborn (1932) referred to *E. trumbulli* as a subspecies of *E. perotis*, whereas Smith and Genoways (1969) referred to this taxon as a species. There is no doubt that these two taxa are aligned, for they belong to the same phenetic cluster, are allopatric, and, according to Brown (1967), are the only members of the genus that lack an *os penis*, but substantial phenetic differences exist between them, as is shown in the preceding analyses. Moreover, *E. perotis* shows a reduction in the third upper molar not found in *E. trumbulli*. In other species of the genus, this dental character was consistent within each species.

Key to Species and Subspecies of *Eumops*

Measurements (mm) given are means and extremes.

1. Forearm length less than 55; cranial length less than 22 2
- 1' Forearm length greater than 55; cranial length greater than 22 4
2. A band of white hair (*ca.* 5 mm wide) between humerus and femur on ventral surface of mesopatagium proximal to body; remainder of body dark Chocolate; forearm length 51–53 *E. maurus*
- 2' No white band on ventral surface of mesopatagium; forearm length less than 50 3
3. Dorsal pelage rich Blackish Brown; ventral pelage white at base; basisphenoid pits deep and long; forearm length 37–41.2; cranial length more than 45 per cent of forearm length *E. hansae*
- 3' Dorsal pelage Snuff Brown to Bister; basisphenoid pits shallow and small; forearm length 36.9–49.4; cranial length less than 45 per cent of forearm length *E. bonariensis*
 - Forearm length 46.8 (43.5–49); cranial length 20.3 (19.6–20.9); Uruguay south to the region of Buenos Aires in Argentina *E. b. bonariensis*
 - Forearm length 44.1 (41.1–46.6); cranial length 18.1 (16.7–19); Bolivia, Paraguay, and northern Argentina *E. b. beckeri*
 - Forearm length 46.1 (45.2–49.4); cranial length 18.6 (18.2–18.8); Amazonian region of central Brazil and Colombia *E. b. delticus*
 - Forearm length 39.4 (36.9–43.2); cranial length 16.8 (15.7–18.1); southern Mexico, Honduras, Panama, northern Colombia, Venezuela, Guyana, and northern Peru *E. b. nanus*
4. Ears long, 39.6 (35–44); tragus large, broad and square; basisphenoid pits deep and elongate; mastoid width less than 52 per cent of condyloincisive length 5

- 4' Ears short, generally less than 35 (17–34); tragus small, pointed or square; basisphenoid pits shallow; mastoid width greater than 52 per cent of condyloincisive length 6
5. Third commissure of M³ one-fourth length of second *E. perotis*
Forearm length 79.9 (73.9–83.3); cranial length 32.6 (31.5–34.4); lachrymal width 10.5 (9.2–11.5); northern Venezuela, southern Brazil, northern Argentina, Paraguay, Bolivia, and east of the Andes in Ecuador, and Peru *E. p. perotis*
Forearm length 75.6 (72–82.7); cranial length 31.8 (30–33.3); lachrymal width 9.4 (8.5–10.5); southern regions of California, Arizona, New Mexico, Texas, and northern Mexico *E. p. californicus*
- 5' Third commissure of M³ one-half length of second; forearm length 70.9 (67.4–75); cranial length 28.7 (26.8–31); lachrymal width 8.1 (7.3–9.1) *E. trumbulli*
6. Size larger, cranial length greater than 28 (males) and 27 (females); ear heavily keeled; dorsal pelage Cinnamon with buff basal band 7
- 6' Size smaller, cranial length less than 28 (males) and 27 (females); pelage Snuff Brown to Sepia (with white basal band) or Blackish Brown; ear not heavily keeled 8
7. Forearm length 77.1 (74.5–79); cranial length 33.8 (32.1–34.8); cranial length greater than 32 (females only); known only from South America *E. dabbenei*
- 7' Forearm length 69.7 (64.3–76.1); cranial length less than 32 (females) and 33 (males); known only from Honduras north to Arizona and New Mexico *E. underwoodi*
Forearm length 71.5 (68.7–76.1); cranial length males 31.1 (30.1–32.6), females 30.2 (29.3–31.4); Honduras, Belize, southern Mexico north to Chihuahua *E. u. underwoodi*
Forearm length 68.1 (64.3–73.5); cranial length males 28.9 (28–29.9), females 28.4 (27.3–29); southern Arizona and state of Sonora, Mexico *E. u. sonoriensis*
8. Tragus small and pointed; dorsal pelage Blackish Brown; basisphenoid pits shallow; mastoid width less than 49 per cent of cranial length *E. auripendulus*
Forearm length 58.5 (55–62.9); cranial length 24.9 (23.4–26.5); Jamaica, southern Mexico south to central Peru and Bolivia *E. a. auripendulus*
Forearm length 63.9 (60.6–68); cranial length 27.9 (25.6–27.8); northern Argentina, Paraguay, and eastern Brazil *E. a. major*
- 8' Tragus broad and square; dorsal pelage Snuff Brown to Bister with white basal band; basisphenoid pits well defined; mastoid width greater than 52 per cent of cranial length *E. glaucinus*
Forearm length 59.4 (55.7–62.2); cranial length 24.4 (22.8–25.8); central Mexico, south to Peru, Bolivia, Paraguay, southeastern Brazil, Jamaica, and Cuba *E. g. glaucinus*
Forearm length (males only) 64.3 (62.5–67.7); cranial length (26.3–27.7); Miami area, Florida *E. g. floridanus*

Acknowledgments

During this study many gave freely of their time and assistance. I particularly thank Dr. R. L. Peterson, who stimulated my interest in bats and under whose direction this problem was initiated and completed.

I borrowed specimens from many museums and thank the following Curators-in-Charge of mammal collections for loan of specimens in their care: Karl F. Koopman, AMNH; Frank B. Gill, ANSP; the late Kenneth Doult, CM; Charles E. Findley, DMNH; Thomas Farr, IJ; Xavier Misonne, IRSNB; Robert S. Hoffman, KU; Donald R. Patten, LACM; George H. Lowery, LSU; Barbara Lawrence, MCZ; C. J. Marinkelle, MHNU; Andre Brosset, MNHN, Brunoy; Jean Dorst, MNHN, Paris; James L. Patton, MVZ; A. M. Husson, RMNH; David J. Schmidly, TCWC; E. Lendell Cockrum, UA; Donald F. Hoffmeister, UI; Oscar T. Owre, UM; Douglas M. Lay and Philip Myers, UMMZ; Elmer C. Birney, MMNH; José Ramírez Pulido, UNAM; Helio Ferraz de Almeida Camargo, USP; and John A. W. Kirsch, YPM. I am also grateful to J. E. Hill, BMNH; Philip Hershkovitz, FMNH; Hugh Genoways, TTU; Charles O. Handley, USNM; and James S. Findley, MSB, for the opportunity to examine specimens in their charge. I also thank B. V. Peterson, Entomology Research Institute, Ottawa, who was instrumental in arranging the loan of specimens from USP, and Albert J. Beck, who provided records on *Eumops perotis californicus*.

R. L. Peterson, M. B. Fenton, and D. M. Power read earlier versions of the manuscript, and D. Valdivieso translated the summary into Spanish.

I am most grateful to A. J. Baker for advice relating to data processing and for making many valuable suggestions.

A special note of thanks goes to J. R. Tamsitt for critically reviewing most versions of the manuscript.

Sophie Poray prepared the diagrams, and Paul Geraghty sketched the line drawings of bats. I thank the staff of the Department of Mammalogy, ROM, for their assistance in preparation of specimens and particularly Nancy Grepe and Geraldine Rerup, who typed various editions of the manuscript. This study was supported in part by a National Research Council of Canada grant (Operating Grant A2385) to R. L. Peterson and by the Royal Ontario Museum.

Summary

Sexual dimorphism in bats of the genus *Eumops* was analyzed using 38 characters and was evident in all taxa studied. Males were larger than females in all characters except length of tibia; and lengths of canines, mandible, and skull were consistently dimorphic characters.

Multivariate statistical techniques were used to evaluate 32 morphometric characters and to determine phenetic affinities among nine species of the genus. Phenetic relationships are presented in phenograms and in two- and three-dimensional models of operational taxonomic units (OTUs) projected onto principal components based on a matrix of correlations among characters. Similarities between pairs of OTUs were determined by average taxonomic distances and correlation coefficients. In some analyses metric data were divided by forearm length to reduce the effect of size. In another analysis the influence of size was reduced by removing the effect of the first principal component from the distances.

Five different phenograms were compared. Using distances without reducing the effect of size only resulted in grouping of taxa of similar size. Correlations and distances with size effect reduced, produced similar results. Principal components analyses established relationships of taxa out of the confines of hierarchical clustering.

Studies of geographic variation in *Eumops auripendulus* suggest that *E. a. auripendulus* consists of a number of variable populations and confirm the presence of two subspecies, *E. a. auripendulus* and *E. a. major*. Likewise, *E. glaucinus* consists of two subspecies, *E. g. glaucinus* and *E. g. floridanus*, with the former also composed of numerous populations.

Based on phenetic groupings and systematic data, I suggest that the following species of *Eumops* be recognized:

Eumops auripendulus, with two allopatric subspecies, *E. a. auripendulus* and *E. a. major*.

E. bonariensis, probably a polytypic species.

E. dabbenei, a monotypic species allied with *E. auripendulus* and *E. underwoodi* rather than a subspecies of *E. perotis*, as so treated by previous reviewers.

E. glaucinus, with two allopatric subspecies, *E. g. glaucinus* and *E. g. floridanus*.

E. hansae, a monotypic species, including *E. amazonicus* as a synonym.

E. maurus, a monotypic species, including *E. geijskesi* as a synonym.

E. perotis, with two allopatric subspecies, *E. p. perotis* and *E. p. californicus*.

E. trumbulli. *E. perotis* and *E. trumbulli* are closely aligned allopatric taxa but are sufficiently distinct to be considered different species.

E. underwoodi, probably a polytypic species.

Resumen

El dimorfismo sexual se analizó usando 38 características y se encontró tal dimorfismo en todos los grupos de *Eumops* estudiados, siendo cada uno dimórfico en diez o más de los parámetros analizados. La longitud de los caninos, de la mandíbula y del cráneo son características dimórficas consistentes. Los machos son de mayor tamaño que las hembras en todas estas características exceptuando la longitud de la tibia.

Técnicas estadísticas multivariadas se utilizaron para evaluar 32 caracteres morfométricos y para determinar las afinidades fenéticas entre las divisiones taxonómicas del género. Estas relaciones fenéticas se presentan en fenogramas. Las unidades taxonómicas operacionales (OTU) se proyectan en los primeros dos y tres componentes principales, basándose en una matriz de correlaciones entre caracteres. Las similitudes entre pares de unidades taxonómicas operacionales se determinaron usando promedios de distancias taxonómicas y coeficientes de correlación. En algunos de los análisis, los datos fueron divididos por la longitud del antebrazo para reducir el efecto del tamaño. En otro análisis, la influencia del tamaño se redujo eliminando el efecto del primer componente principal de las distancias taxonómicas.

Se compararon cinco fenogramas diferentes. Usando distancias sin reducir el tamaño sólo se obtuvieron aglomeraciones de grupos taxonómicos de tamaño similar. Correlaciones y distancias con tamaños disminuídos produjeron resultados similares.

El análisis de funciones discriminativas se usó para estudiar la variación geográfica de *Eumops auripendulus*. Los ejemplares se dividieron en muestras representativas de 10 localidades diferentes. Los resultados indican que las relaciones fenotípicas entre dichas localidades más o menos muestran lo que se encontraría considerando la distancia y la posición geográfica relativa entre dichas localidades. Los ejemplares de Brasil oriental y de Argentina difieren de las poblaciones restantes ya que son considerablemente de mayor tamaño.

De la misma manera, los ejemplares de *E. glaucinus* fueron alocados en muestras correspondientes a ocho localidades diferentes.

El análisis de funciones discriminantes y el análisis estadístico SS-STP (Sum of Squares Simultaneous Test Procedure) de cinco de las características indica que esta especie consiste de razas diferentes: *E. glaucinus floridanus* de Florida, Estados Unidos, y *E. g. glaucinus* de América Central y América del Sur.

Las relaciones taxonómicas del género fueron examinadas usando diferentes métodos de taxonomía numérica. Dichos estudios indican que el coeficiente de correlación es una medida apropiada para agrupar dichas especies en un orden lógico.

Según las agrupaciones fenéticas obtenidas, sugiero que se reconozcan las siguientes especies:

Eumops auripendulus, con dos subespecies alopátricas, *E. a. auripendulus* y *E. a. major*.

E. bonariensis, probablemente una especie politípica.

E. dabbenei, especie monotípica, más relacionada con *E. auripendulus* y *E. underwoodi* en vez de ser una subespecie de *E. perotis* como ha sido tratada previamente por otros autores.

E. glaucinus, con dos subespecies alopátricas, *E. g. glaucinus* y *E. g. floridanus*.

E. hansae, especie monotípica que incluye *E. amazonicus* como un sinónimo.

E. maurus, especie monotípica que aquí incluye *E. geijskesi* como un sinónimo.

E. perotis, consta de dos subespecies alopátricas, *E. p. perotis* y *E. p. californicus*.

E. trumbulli, *E. perotis* y *E. trumbulli*, íntimamente relacionadas, alopátricas, con diferencias significantes que se consideran como especies diferentes.

E. underwoodi, probablemente una especie politípica.

La siguiente clave puede usarse para simplificar la identificación de las divisiones taxonómicas del género *Eumops*.

1. Antebrazo menor de 55 mm; longitud craneal menor de 22 mm 2
- 1' Antebrazo mayor de 55 mm; longitud craneal mayor de 22 mm 4
2. Una banda de pelo blanco (*ca.* 5 mm de anchura) presente entre el húmero y el fémur en la superficie ventral del mesopatagio, próxima al cuerpo; el resto del pelaje del cuerpo de color Chocolate oscuro; antebrazo de 51–53 mm *E. maurus*
- 2' Banda blanca ausente en la superficie ventral del mesopatagio; antebrazo menor de 50 mm 3
3. Pelaje del dorso color negro pardusco (Blackish Brown); pelaje del vientre blanco en la base; concavidades basiesfenoidales largas y profundas; antebrazo 37–41.2 mm; longitud craneal mayor de 45 por ciento de la longitud del antebrazo *E. hansae*
- 3' Pelaje dorsal de color canela rojizo o canela oscuro (Snuff Brown a Bister); concavidades basiesfenoidales poco profundas y pequeñas; antebrazo 36.9–49.4 mm; longitud craneal menor de 45 por ciento de la longitud del antebrazo *E. bonariensis*
 - Antebrazo 46.8 (43.5–49) mm; longitud craneal 20.3 (19.6–20.9) mm; desde Uruguay hasta el sur de la región de Buenos Aires, Argentina *E. b. bonariensis*
 - Antebrazo 44.1 (41.1–46.6) mm; longitud craneal 18.1 (16.7–19) mm; Bolivia, Paraguay y norte de Argentina *E. b. beckeri*
 - Antebrazo 46.1 (45.2–49.4) mm; longitud craneal 18.6 (18.2–18.8) mm; región amazónica de Brasil central y Colombia *E. b. delticus*
 - Antebrazo 39.4 (36.9–43.2) mm; longitud craneal 16.8 (15.7–18.1) mm; sur de México, Honduras, Panamá, norte de Colombia, Venezuela, Guayana y norte del Perú *E. b. nanus*
4. Orejas largas, 39.6 (35–44) mm; trago grande, ancho, cuadrangular; concavidades basiesfenoidales profundas y elongadas; anchura mastoidea menos del 52 por ciento de la longitud condilobasal 5
- 4' Orejas cortas, generalmente menores de 35 (17–34) mm; trago pequeño, puntiagudo o cuadrangular; concavidades basiesfenoidales pandas; anchura mastoidea mayor de 52 por ciento de la longitud condilobasal 6

5. Tercera comisura de M^3 un cuarto de la longitud de la segunda ... *E. perotis*
 Antebrazo 79.9 (73.9–83.3) mm; longitud craneal 32.6 (31.5–34.4) mm;
 anchura lacrimal 10.5 (9.2–11.5) mm; norte de Venezuela, sur de Brasil,
 norte de Argentina, Paraguay, Bolivia y este de la cordillera de los Andes
 en Ecuador y Perú *E. p. perotis*
 Antebrazo 75.6 (72–82.7) mm; longitud craneal 31.8 (30–33.3) mm; an-
 chura lacrimal 9.4 (8.5–10.5) mm; regiones del sur de California, Arizona,
 Nuevo México, Texas en los Estados Unidos y norte de México
 *E. p. californicus*
- 5' Tercera comisura de M^3 la mitad de la longitud de la segunda; antebrazo 70.9
 (67.4–75) mm; longitud craneal 28.7 (26.8–31) mm; anchura lacrimal 8.1
 (7.3–9.1) mm *E. trumbulli*
6. Tamaño mayor; longitud craneal mayor de 28 mm (en machos) y 27 mm (en
 hembras); orejas bien quilladas; pelaje dorsal de color canela (Cinnamon)
 con una banda amarilla leve basalmente 7
- 6' Tamaño menor; longitud craneal menor de 28 mm (en machos) y 27 mm (en
 hembras); pelaje gris canela (Snuff Brown a Sepia) con banda basal blanca o
 canela negruzco (Blackish Brown); orejas ligeramente quilladas 8
7. Antebrazo 77.1 (74.5–79) mm; longitud craneal 33.8 (32.1–34.8) mm,
 mayor de 32 sólo en hembras; conocida solamente de América del Sur
 *E. dabbenei*
- 7' Antebrazo 72 (69.7–76.1) mm; longitud craneal menor de 32 mm (en hem-
 bras) y 33 (en machos); conocida solamente de Honduras hasta el sur de
 Arizona *E. underwoodi*
 Antebrazo 71.5 (68.7–76.1) mm; longitud craneal en machos 31.1
 (30.1–32.6) mm, en hembras 30.2 (29.3–31.4) mm; de Honduras, Belize,
 sur de México hasta Chihuahua en el norte *E. u. underwoodi*
 Antebrazo 68.1 (64.3–73.5) mm; longitud craneal en machos 28.9
 (28–29.9) mm, en hembras 28.4 (27.3–29) mm; sur de Arizona y Estado de
 Sonora, México *E. u. sonoriensis*
8. Trago pequeño y puntiagudo; pelaje dorsal canela negruzco (Blackish
 Brown); concavidades basiesfenoidales pandas; anchura mastoidea menor
 de 49 por ciento de la longitud total del cráneo *E. auripendulus*
 Antebrazo 58.5 (55–62.9) mm; longitud craneal 24.9 (23.4–26.5) mm;
 sur de México hasta Bolivia y la región amazónica del Brasil y Jamaica
 *E. a. auripendulus*
 Antebrazo 63.9 (60.6–68) mm; longitud craneal 27.9 (25.6–27.8) mm; norte
 de Argentina, Paraguay y este del Brasil *E. a. major*
- 8' Trago ancho y cuadrangular en su extremidad distal; pelaje dorsal de color
 canela grisaseo (Snuff Brown a Bister) con banda blanca basal; con-
 cavidades basiesfenoidales bien definidas; anchura mastoidea mayor de 52
 por ciento de la longitud total del cráneo *E. glaucinus*
 Antebrazo 59.4 (55.7–62.2) mm; longitud craneal 24.4 (22.8–25.8) mm;
 desde el centro de México hasta el sur del Perú, Bolivia, Paraguay, sureste
 del Brasil, Jamaica y Cuba *E. g. glaucinus*
 Antebrazo (sólo machos) 64.3 (62.5–67.7) mm; longitud craneal
 26.9 (26.3–27.7) mm; región de Miami, Florida, Estados Unidos
 *E. g. floridanus*

Literature Cited

ACOSTA Y LARA, E.

- 1950 Quirópteros del Uruguay. *Comunicaciones Zoológicas del Museo de Historia Natural de Montevideo*, 58 (3): 1-71.

ALLEN, G. M.

- 1932 A pleistocene bat from Florida. *Journal of Mammalogy*, 13 (3): 256-259.

ALLEN, H.

- 1889 On the genus *Nyctinomus* and description of two new species. *Proceedings American Philosophical Society*, 26: 558-563.
1893 A monograph of the bats of North America. *Bulletin United States National Museum*, 43: 1-198.

ALLEN, J. A.

- 1897 On a small collection of mammals from Peru with descriptions of a new species. *Bulletin American Museum of Natural History*, 9: 115.
1900 List of bats collected by Mr. H. H. Smith in the Santa Marta region of Colombia with descriptions of new species. *Bulletin American Museum of Natural History*, 13 (8): 87-94.
1904 New bats from tropical America with a note on species of *Otopterus*. *Bulletin American Museum of Natural History*, 20 (20): 227-237.

ARNOLD, J. R. AND J. SCHONEWALD

- 1972 Notes on the distribution of some bats in Southern Mexico. *The Wasmann Journal of Biology*, 30 (1 & 2): 171-174.

BAKER, R. J., W. R. ATCHLEY AND V. R. DANIELS

- 1972a Karyology and morphometrics of Peter's tent-making bat, *Uroderma bilobatum* Peters (Chiroptera: Phyllostomatidae). *Systematic Zoology*, 21 (4): 414-429.

BAKER, R. J., A. L. GARDNER AND J. L. PATTON

- 1972b Chromosome polymorphism in the phyllostomatid bat, *Mimon crenulatum* (Geoffroy). *Experientia*, 28: 969-970.

BARBOUR, R. W. AND W. H. DAVIS

- 1969 *Bats of America*. Lexington, The University Press of Kentucky. 286 pp.

BENSON, S. B.

- 1947 Description of a mastiff bat (genus *Eumops*) from Sonora, Mexico. *Proceedings of the Biological Society of Washington*, 60: 133-134.

BIRNEY, E. C., J. B. BOWLES, R. M. TIMM AND S. L. WILLIAMS

- 1974 Mammalian distribution records in Yucatán and Quintana Roo, with comments on reproduction, structure, and status of peninsular populations. *Bell Museum of Natural History, University of Minnesota, Occasional Papers* 13: 1-25.

BROSSET, A. ET G. DUBOST

- 1967 Chiroptères de la Guyane Française. *Mammalia* 31 (4): 583-594.

BROWN, R. E.

- 1967 Bacula of some New World molossid bats. *Mammalia*, 31 (4): 645-667.

BUFFON, G. L. L.

- 1789 *Histoire naturelle générale et particulière*. Paris, Supplément, 7. Paris, De l'Imprimerie Royale. 364 pp.

CABRERA, A.

- 1957 Catálogo de los mamíferos de America del Sur. *Revista del Museo Argentino de Ciencias Naturales, Buenos Aires*, 4 (1). 307 pp.

COOLEY, W. W. AND P. R. LOHNES

- 1971 *Multivariate data analysis*. New York, John Wiley & Sons. 364 pp.

- CROVELLO, T. J.
1969 Effects of change of characters and of number of characters in numerical taxonomy. *American Midland Naturalist*, 81 (1): 68–86.
- DARLINGTON, P. J., JR.
1957 *Zoogeography: the geographical distribution of animals*. New York, John Wiley & Sons. 675 pp.
- DOBSON, G. E.
1876 A monograph of the group Molossi. *Proceedings Zoological Society, London*: 701–735.
- EASTERLA, D. A. AND J. O. WHITAKER
1972 Food habits of some bats from Big Bend National Park, Texas. *Journal of Mammalogy*, 53 (4): 887–890.
- EGER, J. L.
1974 A new subspecies of the bat *Eumops auripendulus* (Chiroptera: Molossidae), from Argentina and eastern Brazil. *Life Science Occasional Papers*, 25, Royal Ontario Museum: 1–8.
- FINDLEY, J. S.
1972 Phenetic relationships among bats of the genus *Myotis*. *Systematic Zoology*, 21 (1): 31–52.
- GABRIEL, K. R.
1964 A procedure for testing the homogeneity of all sets of means in analysis of variance. *Biometrics*, 20: 459–477.
- GABRIEL, K. R. AND R. R. SOKAL
1969 A new statistical approach to geographic variation analysis. *Systematic Zoology*, 18 (3): 259–278.
- GARDNER, A. L., R. K. LAVAL AND D. E. WILSON
1970 The distributional status of some Costa Rican bats. *Journal of Mammalogy*, 51 (4): 712–729.
- GEOFFROY-SAINT-HILAIRE, E.
1805 Mémoire sur quelques chauve-souris d'Amérique formant une petite famille sous le nom *molossus*. *Annales Museum d'Histoire Naturelle, Paris*, (6): 150–156.
1818 Description de l'Égypte. Histoire naturelle. Description des mammifères qui se trouvent en Égypte, Vol. 2: 99–135.
- GERVAIS, P.
1855–1856 Documents zoologiques pour servir à la monographie des Chéiroptères sud-américains. *In* P. Gervais, *Mammifères* 7: 25–88.
- GILMORE, R. M.
1947 Report on a collection of mammal bones from archaeological cave-sites in Coahuila, Mexico. *Journal of Mammalogy*, 28 (2): 147–165.
- GOODWIN, G. G.
1940 Three new bats from Honduras and the first record of *Enchisthenes harti* (Thomas) for North America. *American Museum Novitates*, 1075: 1–3.
1956 A preliminary report on the mammals collected by Thomas MacDougall in southeastern Oaxaca, Mexico. *American Museum Novitates*, 1757: 1–15.
1960 The status of *Vespertilio auripendulus* Shaw, 1800, and *Molossus ater* Geoffroy, 1805. *American Museum Novitates*, 1994: 1–6.
1969 Mammals from the state of Oaxaca, Mexico, in the American Museum of Natural History. *Bulletin American Museum of Natural History*, 141 (1): 1–269.
- GUNDLACH, M. B.
1862 In a meeting of the Academy, 17 January 1861. *Monatsberichte der königlichen Preufs. Akademie der Wissenschaften zu Berlin*.

- HAFFER, J.
1969 Speciation in Amazonian forest birds. *Science*, 165: 131-137.
- HALL, E. R., AND B. VILLAR.
1949 Mammals of Michoacan, Mexico. University of Kansas Publications, Museum of Natural History, 1 (22): 431-472.
- HANDLEY, C. O., JR.
1955 A new species of free-tailed bat (genus *Eumops*) from Brazil. *Proceedings of the Biological Society of Washington*, 68: 177-178.
- HAYMAN, R. W. AND J. E. HILL
1971 Chiroptera. In *The mammals of Africa, an identification manual*. J. Meester and H. W. Setzer, eds. Washington, D.C., Smithsonian Institution Press. 93 pp.
- HUSSON, A. M.
1962 The bats of Suriname. *Zoologische Verhandelingen*, 58. Leiden, Rijksmuseum van Natuurlijke. 282 pp.
- ILLIGER, J. R. W.
1811 *Prodromus systematis mammalium et avium; additis terminis zoographicis utrinusque classis, eorumque versione germanica ... Berolini sumptibus C. Salfeld: 122.*
- JONES, J. K., JR., J. D. SMITH AND H. H. GENOWAYS
1973 Annotated checklist of mammals of the Yucatan Peninsula, Mexico. I. Chiroptera. *Occasional Papers, The Museum, Texas Tech University*, 13: 1-31.
- KOOPMAN, KARL F.
1971 The systematic and historical status of the Florida *Eumops* (Chiroptera: Molossidae). *American Museum Novitates*, 2478: 1-6.
- LINARES, OMAR J.
1968 Quirópteros subfósiles encontrados en las cuevas venezolanas. *Boletín de la Sociedad Venezolana de Espeleología*, 1 (2): 119-145.
- LINNAEUS, C.
1758 *Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Holmiae*, 1, ed. 10. 824 pp.
- MATSON, J. O. AND D. R. PATTEN
1975 Notes on some bats from the state of Zacatecas, Mexico. *Contributions in Science*, 263, *Natural History of Los Angeles County*: 1-12.
- MERRIAM, C. H.
1890 Description of a new species of *Molossus* from California (*Molossus californicus*). *North American Fauna* 4: 31-32.
- MILLER, G. S.
1900 A new free-tailed bat from Central America. *Annals and Magazine of Natural History*, 7 (6): 470-471.
1902 General notes. The common *Nyctinomus* of the Greater Antilles. *Proceedings of the Biological Society of Washington*, 15: 247-250.
1906 Twelve new genera of bats. *Proceedings of the Biological Society of Washington*, 19: 83-86.
- MILLER, G. S. AND J. A. G. REHN
1902 Systematic results of the study of North American land mammals to the close of the year 1900. *Proceedings Boston Society of Natural History*, 30: 271.
- OJASTI, J. AND O. J. LINARES
1971 Adiciones a la fauna de murciélagos de Venezuela con notas sobre las especies del género *Diclidurus* (Chiroptera). *Acta Biologica Venezuelica*, 7: 421-441.

- OKEN, L.
1816 Lebruch der Naturgeschichte Dritter Theil Zoologie, Zweite Ubtheilung. Fleischthiere. Leipzig, C. H. Reclam.
- PENNANT, T.
1793 History of quadrupeds. 3rd edition. Volume 2. London, B. & J. White. 324 pp.
- PETERS, W.
1864 Sitzung der physikalish-mathematischen Klasse. Monatsberichte der Königlichen Preussischen Akademie der Wissenschaften zu Berlin: 381–383.
1874 Hr. W. Peters las über eine neue Art von Flederthieren *Promops bonariensis* und über *Lophuromys* eine Nagergattung von Westafrika. Monatsberichte der Königlichen Preussischen Akademie der Wissenschaften zu Berlin: 232–234.
- PIRLOT, P.
1965 Deux formes nouvelles de chiroptères des genres *Eumops* et *Leptonycteris*. Le Naturaliste Canadien, 92 (1): 5–7.
- POWER, D. M.
1970 Geographic variation of red-winged blackbirds in central North America. University of Kansas Publications, Museum of Natural History, 19 (1): 1–83.
- PUENTE, J. O. DE LA
1951 Estudio monografico de los quiropteros de Lima y Alfrededores. Publicaciones del Museo de Historia Natural "Javier Prado". Serie A. Zoologia, 7: 1–46.
- RAY, C. E., S. J. OLSEN AND H. J. GUT
1963 Three mammals new to the Pleistocene fauna of Florida, and a reconsideration of five earlier records. Journal of Mammalogy, 44 (3): 373–395.
- RIDGWAY, R.
1912 Color standards and color nomenclature. Washington, D.C., published by the author. 43 pp.
- ROBBINS, J. D. AND G. D. SCHNELL
1971 Skeletal analysis of the *Ammodramus-Ammospiza* Grassland Sparrow complex: a numerical taxonomic study. The Auk, 88 (3): 567–590.
- ROHLF, F. J.
1970 Adaptive hierarchical clustering schemes. Systematic Zoology, 19 (1): 58–82.
- ROSEN, D. E.
1975 A vicariance model of Caribbean biogeography. Systematic Zoology, 24 (4): 431–464.
- ROSS, A.
1961 Notes on food habits of bats. Journal of Mammalogy, 42 (1): 66–71.
- ROWLETT, R. A.
1972 First records of *Eumops perotis* and *Microtus ochrogaster* in New Mexico. Journal of Mammalogy, 53 (3): 640.
- SANBORN, C. C.
1932 The bats of the genus *Eumops*. Journal of Mammalogy, 13 (4): 347–357.
1949 Mammals from the Rio Ucayali, Peru. Journal of Mammalogy, 30 (3): 277–288.
- SCHINZ, H. R.
1821 Das thierreich 1: 870.
- SCHNELL, G. D.
1970 A phenetic study of the suborder *Lari* (Aves) II. Phenograms, discussion and conclusions. Systematic Zoology, 19 (3): 264–302.
- SEAL, H. L.
1966 Multivariate statistical analysis for biologists. London, Methuen, 209 pp.

- SHAW, G.
1800 General zoology; or systematic natural history. 1 (1). Mammalia. London, G. Kearsley. 248 pp.
- SMITH, J. D.
1972 Systematics of the chiropteran family Mormoopidae. University of Kansas, Museum of Natural History Miscellaneous Publication, 56: 1-132.
- SMITH, J. D. AND H. H. GENOWAYS
1969 Systematic status of the mastiff bat, *Eumops perotis renatae* Pirlot, 1965. Mammalia, 33 (3): 529-534.
- SNEATH, P. H. A. AND R. R. SOKAL
1973 Numerical taxonomy. San Francisco, W. H. Freeman and Company. XV + 573 pp.
- SOKAL, R. R. AND C. D. MICHENER
1967 The effects of different numerical techniques on the phenetic classification of bees of the *Hoplitis* complex (Megachilidae). Proceedings Linnean Society of London, 178: 59-74.
- SOKAL, R. R. AND F. J. ROHLF
1969 Biometry. San Francisco, W. H. Freeman and Company. 776 pp.
- SPIX, J. B. VON
1823 Simiarum et Vespertilionum Brasiliensium Species Novae.
- TEMMINCK, C. J.
1827 Monographies de mammalogie ou Description de quelques genres de mammifères, dont les espèces ont été observées dans les différens musées de l'Europe. Paris, G. Dufour et d'Ocogne. 1 (1). 268 pp.
- THOMAS, O.
1901 On a collection of mammals from the Kanuku Mountains, British Guiana. Annals and Magazine of Natural History, 8 (7): 139-154.
1914 New *Callicebus* and *Eumops* from S. America. Annals and Magazine of Natural History, 8 (13): 480-481.
1923 Two new mammals from Marajó Island. Annals and Magazine of Natural History, 12 (9): 341-342.
1924 New South American small mammals. Annals and Magazine of Natural History, 9 (13): 234.
- TROUSSART, E. L.
1904 Catalogus mammalium tam viventium quam fossilium. Quinquennale supplementum anno 1904. Berlin. 929 pp.
- VILLA R., B.
1956 Otros murciélagos nuevos para la fauna de México. Anales del Instituto de Biología, México, 26: 543-545.
- WAGNER, A.
1843 Diagnosen neuer Arten brasilischer Handflüger. Archiv fur Naturgeschichte, 9 (1): 365-368.
- WALKER, E. P.
1968 Mammals of the world, Vol. 1, 2nd edition. Revised by J. L. Paradiso, Baltimore, Johns Hopkins Press. 644 pp.
- WARNER, J. W., J. L. PATTON, A. L. GARDNER AND R. J. BAKER
1974 Karyotypic analyses of twenty-one species of molossid bats (Molossidae: Chiroptera). Canadian Journal of Genetics and Cytology, 16: 165-176.
- WETZEL, R. M. AND J. W. LOVETT
1974 A collection of mammals from the Chaco of Paraguay. University of Connecticut Occasional Papers Biological Science Series, 2 (13): 203-216.
- WIED, M. P.
1826 Beitrage zue Naturgeschichte von Brasilien. Weimar, 2. 620 pp.